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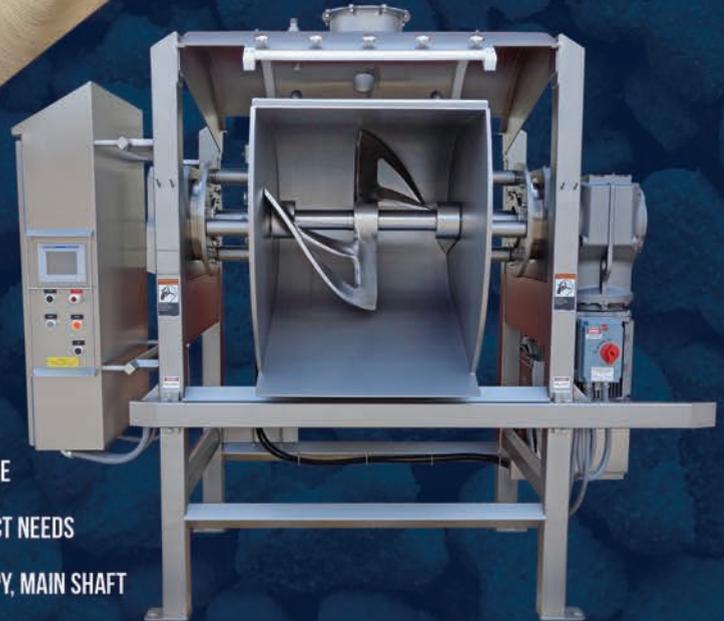
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Cover: To prevent the spread of COVID-19, extra attention is being given to cleaning non-production areas.
Photo source: ©Parilov Evgeniy - stock.adobe.com



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Gratitude returned

Why does it take big events to remind us that we're in this together and the health and well being of others affects all of us? It always has. Maybe we've lost sight of that occasionally or failed to communicate that the health and well being of others is important to us.

A worldwide pandemic certainly amplifies that fact and many companies I've spoken with are rising to the challenge by not only expressing but demonstrating that they value their employees and understand that their health and well being affects the viability of the company and the community as a whole.

Caring about each other's well being is circular. Being appreciated and valued has long been at the top of the list of what we humans want and desire. How simple it is then to energize, motivate and support each other with a little bit of expressed gratitude, appreciation and genuine concern.

Businesses in the pet food and treat industry are demonstrating through decisions and actions that the employees who make it possible for the company to exist are what is valued most. Some companies are providing masks and sanitation supplies not only for each employee but enough for their households. Many businesses are showing employees that the company understands they have many responsibilities in addition to their jobs. Companies are adjusting sick leave policies to allow employees time to recover from illness or care for family members.

Business leadership teams are opening the lines of communication to explain the expanded protocols designed to keep employees safe and also to answer questions and receive feedback from the employees. Businesses are acknowledging the emotional toll the pandemic upheaval has caused and making mental health resources available to those who need assistance. Katie Evans, external affairs manager at Mars Petcare, St. Louis, Mo., said the company is adopting policies to protect employee health, provide extra flexibility to manage quarantine situations, and deal with the anxiety and impact created by the pandemic.

If you've ever raised a teenager and relied on *Love and Logic* as a guide, you'll remember that sincere empathy is the point from which all things good start. This is where appreciation and gratitude come full circle and present opportunity. Speaking to CNBC recently, Mark Cuban said how companies treat workers during this pandemic could define their brand for decades.

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people FOOD

Human brands, including those that represent celebrities, are entering the pet market.

By Lynn Petrak | petfoodprocessing@sosland.com

What's in a name? When it comes to branded products, a recognizable name lends a certain cachet.

While many familiar names — Purina, Alpo, Iams and Meow Mix, to name a few — are associated with pet food products, well-established brands in the human food category are now moving into the pet market. These newcomers include brands that represent popular public figures as well as longtime companies with deep roots in human foods.

The cross-industry penetration reflects both the growing humanization of pets and the lucrative opportunities that the pet marketplace presents.

As mentioned in a June 2019 podcast from Nielsen, the humanization of pets “is driving trends across the pet food industry that align with many of the trends we’re seeing in the human food and beverage industry.”

That alignment with trends sets up an alignment of brands. The market is particularly ripe for these new possibilities in the wake of the COVID-19 global health crisis and subsequent home quarantines.

“The United States pet population has now exceeded 200 million for the first time, led by record-breaking adoption during the pandemic,” said retail analyst Burt Flickinger, managing director, Strategic Resource Group, New York City.

Along with a higher pet population comes greater spending on pet products, including treats and foods that people buy from trusted names.

“There are opportunities for branded pet products,” Flickinger said. “We’re seeing people spending more per pet, even more than they’re spending per person, on foods, treats and accessories.”

Rick Ruffolo, president and chief executive officer,

Sweetgreen, a restaurant chain in the United States serving healthy, made-from-scratch meals, partnered with Wild One to develop a dehydrated plant-based dog treat. Wild One





Left: Ree Drummond, also known as The Pioneer Woman, partnered with Purina in April 2019 to launch a line of dog treats featuring home-style cooking flavors.

The Pioneer Woman

Right: Rachael Ray, a celebrity cook and TV personality, partnered with Ainsworth Pet Nutrition in 2008 to develop her Nutrish line of super premium pet food and treats, which is now owned by The J.M. Smucker Company.

Cindy Ord, Getty Images

Phelps Pet Products, Rockford, Ill., agreed human brands that have built a reputation on quality resonate with pet parents, especially newer pet parents.

“First-time pet parents often are faced with new situations and decisions they never have made on their own,” Ruffolo said. “Similar to human parents who are faced with decisions for their first baby, these new pet parents look to experts — other pet owners, doctors/vets, and influential brands — to help guide or validate their decision-making. This also is why familiar brands and retail private labels that consumers know and trust can be very important.”

Additionally, more human brands are able to find success in the pet market thanks to changing marketplace dynamics. Flickinger cited the experience that some CPG leaders have brought to pet brands from the human brand space and the acquisition of pet product portfolios by venerable CPGs.

Similar observations have been noted by Ruffolo, a behind-the-scenes contract-manufacturing partner.

“We clearly have seen the expanding influence that the humanization trend has on the pet food and pet treat market across multiple platforms,” he said. “You see it with the continued acquisitions by large CPG companies such as General Mills’ acquisition of Blue Buffalo and Smucker’s acquisition of Rachael Ray’s [Nutrish brand]. The human food brands recognize there is a blurring of the lines between what’s right for me/my family and what’s appropriate for my dog. There clearly is opportunity for the brands to extend their equities into the pet market.”

A popular company that has extended its brand equity to the pet sector is Omaha Steaks, which launched a line of pet treats using all-natural ingredients in 2018.

“As America’s Original Butcher, Omaha Steaks is known nationwide for our legendary steaks, and our line of dog treats are carefully crafted with the same

premium quality ingredients that customers expect in everything we offer,” said Todd Simon, senior vice president and family owner. “The packaging also shares the same butcher-quality look as our iconic product boxes.”

It was a natural decision to segue into pet products for this Omaha, Neb.-based company.

“For generations, Omaha Steaks has been bringing families together around the dinner table and we are sure that many dogs have enjoyed bites of filet mignon slipped to them under the table,” Simon said. “With our line of pet treats, we wanted to offer something made exclusively for the family dogs to make sure they were fed just as well as everyone else.”

“We clearly have seen the expanding influence that the humanization trend has on the pet food and pet treat market across multiple platforms.”

Rick Ruffolo, Phelps Pet Products

Celebrity chefs and personalities are also getting in on pet food products, building on their human brand capital. Rachael Ray’s Nutrish line of pet foods, part of The J.M. Smucker Co. in Orrville, Ohio, includes offerings for dogs and cats and spans dry and wet food, soft

meat treats, chews and dental treats. That line continues to expand, too, with new items like SuperMedley recipes made with added vitamins, minerals and taurine, and broths for cats.

The Pioneer Woman brand, started by cookbook author and star Ree Drummond, has also expanded to include pet items. St. Louis-based Nestlé Purina PetCare teamed up with The Pioneer Woman to offer dog treats and chews, including culinary-inspired varieties like bacon, apple and maple “waffles,” and beef and brisket BBQ-style treats.

Beyond retail products, some restaurants popular with humans are going beyond doggie bags for leftovers and offering real packaged products for dogs. Many Shake Shack stores, for example, offer a “Shackburger” dog biscuit with all-natural ingredients made by Bocce Bakery.

Sweetgreen is another restaurant chain that has offered pet treats under its name. The treats were made by Wild One Treats, Brooklyn, N.Y.

“Wild One and Sweetgreen share the same values when it comes to food sourcing and transparency in our

supply chain,” said Minali Chatani, co-founder and head of brand, Wild One. “The apples and sweet potatoes featured in the limited edition Sweetgreen treats were ethically sourced from farmers we know and trust.”

Chatani said Wild One remains open to additional partnerships with human-centric brands.

“As for treat collaborations – they’re a ton of fun so I hope there are more to come!” she said.

According to Simon, there may be additions to Omaha Steaks’ pet offerings as that category continues to grow.

“While we remain focused on our current dog treat offerings, we are always looking toward the future,” he concluded. “We believe there is an opportunity to get our dog treats into more consumers’ hands by looking at other markets, and we are always excited to explore new opportunities and ideas as they emerge.”



Omaha Steaks saw an opportunity to serve more customers in the same household by adding premium dog treats to their product mix.

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RECIPE FOR RESILIENCE

Seven tips for building a resilient business capable of navigating the challenges ahead.

By Jennifer Semple | jsemple@sosland.com

Most who have managed a business of any size would say that it is not a straight path. Manufacturing businesses are particularly challenging, and companies are presented with many twists and turns along their journey. Being resilient as a company doesn't necessarily mean staying the course. A resilient company is able to identify the path through whatever stands in its way.

Pet Food Processing talked with pet food and treat processors, both big and small, and industry leaders about what is required for a company to be resilient in good and bad times, as well as some of the key strategies helping companies be resilient in today's market upheaval.

1. Capital, of course

Enough capital or a plan to obtain more capital is ideal, if not always possible, said John Kuenzi, president and chief executive officer of consulting company NQV8, Manhattan, Kan. Companies need to plan ahead to have adequate cash reserves or the ability to source funding when needed. Kuenzi said good relationships with vendors, bankers and investors help make that possible.

"It's always better to be well-capitalized to the point that you can withstand a sustained period of poor income generation, but that's not always the reality of a startup or someone already struggling," Kuenzi said. "This requires adequate funding by design and additional resources as necessary to withstand retractions and having enough runway for the dry spell. Most startups by definition are undercapitalized."

At a minimum, Alexis Berglund, president, The Pound Bakery, Harvard, Ill., recommends that small

companies have emergency funds set aside to cover three to six months of expenses or an available line of credit to tap to get through a rough patch.

A common mistake Richard Thompson, founder of Factory LLC, an accelerator program in Bethlehem, Pa., has seen from working with startups is how far in advance they plan what capital the business will require. Thompson said many young companies plan what capital they will need over the coming 12 to 18 months. He suggests looking farther ahead.

"A better approach is a three- or five-year plan and raise all the capital at once based on performance milestones," Thompson said. "A lot of people [who] just get capital on an annual basis run out, and then it becomes an emergency."

Adding that hope isn't the best business strategy especially in the current economy, Thompson said, "You just can't be a startup and hope that it's all going to work. You really need a lot of capital as well as really good management. It was difficult to get both of those before this health crisis and now, it's even harder to find the capital."

2. Priority to the people

A clear understanding of the company's hierarchy of priorities, as a standard rule, and clearly defined priorities during a crisis are key. For many companies, but not all, the people working for the company — the people making it possible for the company to provide a product or service — are the top priority because, as Thompson pointed out, you don't have a company without the people.



Diversifying its processing capabilities has helped the team at Pedigree Ovens and The Pound Bakery be resilient.

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A company's ability to be resilient depends on the employees being the top priority, according to Chris Hamilton, president and chief executive office, Red Collar Pet Foods, Franklin, Tenn.

"To create a resilient company, the culture needs to be anchored in responsibility," Hamilton said. "At Red Collar, we strive to have each associate feel a personal connection to the business and a responsibility toward the success of themselves and the business.

"One thing a lot of the companies are facing right now is how strong that commitment is to resilience from the leadership team," he added. "The culture needs to be strong from the senior team through everyone in the company so that resilience and the responsibility for the business overall and for the associates are felt throughout all aspects of the organization."

Having clearly defined priorities becomes even more important in a crisis.

"Early on [in the COVID-19 crisis] we made the determination to make decisions through the lens of the safety and well being of our associates because, without our associates, we don't have a business," Hamilton said.

3. Be visible and communicate often

As a leader, being seen and frequently communicating with employees helps to make informed decisions and address challenges. Hamilton believes the leaders of an organization need to take decisive action in real-time during a crisis with the best possible information available, which points to the importance of communication.

"The leadership team has met [virtually] every day at 9 a.m., seven days a week during the pandemic crisis," he said. "We discuss the last 24 hours, what decisions need to be made as a team and the internal and external resources required for those decisions. We then turn around and have two calls a day with our operational sites. No one is making decisions with information that is more than 24 hours old."

As a part of normal business operations at Red Collar, providing frequent opportunities for two-way communication between associates and the leadership team has benefitted the company.

"Our policies have evolved at Red Collar based on our associate feedback," Hamilton said. "In working in conjunction with them, we are able to make our policies better and our company more resilient."

4. Build strong partnerships

Anne Carlson, chief executive officer, Jiminy's, Berkeley, Calif., said company leaders should always be building relationships but, when faced with a crisis, that foundation comes in handy.

"Good relationships with vendors, suppliers, and customers can get you through difficult times as communication and clarity are vital," Carlson said. "Relationships built on trust enable partners to ask for help when necessary. Actions, like offering extra time for a payment or sharing ideas on new ways to reach consumers with emerging new behaviors, will occur a lot easier and more frequently if you've built a good relationship with your partners."

Purina PetCare shared that closely monitoring the supply chain and keeping in contact with all parties is critical when managing something as broad and far-reaching as the challenges created by COVID-19.

"We are reviewing new information daily and working with both our supply and retail partners to put actions in place to alleviate any impacts," said Joe Toscano, director of sales at Purina PetCare, St Louis. "For us, close collaboration and regular communication with all of our partners is key."

Thompson pointed out that a crisis quickly identifies which partners a company can count on.

"Businesses have seen [during the COVID-19 crisis] who their partners are and who they can depend on, who was able to really help them and who was willing to step forward and do what's necessary to help move them forward," Thompson said. "Companies have found out who is on their team."

5. No waffling

Navigating a business through challenges requires action. Often, there is no time for waffling. Kuenzi

shared that companies who have leaders willing to take action tend to fare better when faced with a challenge. He added that the key to managing a crisis is strong and level-headed leadership.

"A good leader should develop a great dashboard and a bias to action."

John Kuenzi, NQV8

"A good leader should develop a great dashboard and a bias to action, pivoting when necessary but always open to new methods, technologies and approaches in light of new market conditions," Kuenzi said.

He added leaders must survey the environment and make decisions with the information that is currently available to them.

Hamilton said he believes Red Collar's decision to act quickly concerning the COVID-19 pandemic has worked in the company's favor.

"We did our best to get ahead of it and that made a huge difference," Hamilton said. "The second Saturday of March, our chief operating officer and I decided to assemble the crisis management team and call it a crisis."

For a company the size of Red Collar with six manufacturing facilities across the United States, following crisis management protocols costs the company both time and resources, but it puts the company in a better position to manage a crisis versus playing catch up.

"It seems simple, but by declaring we were actually in a crisis in early March, this marshaled together all the resources, the policies and procedures associated with our crisis protocol and brought them to bear on the issue," Hamilton said.

6. Willing to pivot

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important than it is today. Kuenzi said that company leadership should have the flexibility and willingness to go in a different direction when necessary.

“Past success is no guarantee of future success,” Kuenzi said. “Be honest with yourself and do what you need to do. Sometimes the market — or cheese — moves, you have to move with it. Loyalty to a petrified opinion will not see you through a crisis.”

Berglund said companies are more resilient if they stay open-minded to trying new things.

“This pandemic will hopefully leave us all more willing to change business approaches to meet our customers’ demands,” Berglund said. “As things change, we need to change to meet our customers’ needs.”

Berglund points out that a diversified product offering to a broad customer base can often help a company

Anne Carlson from Jiminy’s keeps going when things don’t go as planned by being flexible and focusing on the company’s guiding purpose of combating climate change with sustainable pet food and treats. *Jiminy’s*

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respond to market fluctuations and endure tough times.

“As a manufacturer, we have found it very important to offer a large range of products that hit different markets,” Berglund said. “Throughout past recessions, we have seen certain markets grow where others have struggled. Some customer groups have almost completely stopped ordering overnight, while others have increased demand. Diversifying our efforts has helped us stay resilient.”

From Thompson’s viewpoint, a processor has a much greater ability to change and adapt when it controls its own manufacturing.

“I prefer to own my own manufacturing where I have my own intellectual property and flexibility,” Thompson said. “I’m a guy who likes to build factories and have the flexibility to do what I want, when I want, how I want.”

When faced with the market upheaval of the pandemic, Thompson said to focus on the products that work best and put other products on the back burner.

“Figure out what is the best-selling product you have and focus on that,” he suggested. “Focus on which of your existing products the consumer needs and get it into the marketplace. If you have product that is resonating with a buyer and a consumer [the pet], focus on that.”

Carlson described how the company has maintained its equilibrium in the midst of furious gear-shifting.

“We were just beginning our dog food launch when COVID-19 hit, so a big celebration would be tone-deaf and actually dangerous,” Carlson said. “That pushed us to pivot to information sharing and focusing in on how this new food helps everyone reduce their family’s carbon footprint – or, if you prefer, pawprint. When the river you’re paddling on is flowing rapidly toward a waterfall, staying on course doesn’t make much sense.”

Although the natural instinct in uncertain times is to hunker down and wait it out, Kuenzi said that sometimes the disciplined thing to do is take a calculated risk.

“Yes, leaders need to be good stewards of the company resources, but they also must take calculated risk and believe that good things can and will happen,” Kuenzi said. “Belief is a powerful thing.”

7 Survival is winning

NQV8 advised every startup not to get wrapped up in what they believe progress should look like and how it matches up with their original, ideal scenario. This advice applies to companies of all sizes. The sooner a company recognizes its situation and takes steps to mitigate or improve it, the better the company can weather the storm.

Kuenzi said attitude, effort and movement go a long way to help a company be resilient, especially in times like these.

“Stay positive... lean in and lend a hand wherever possible,” Kuenzi said. “... All in all, no problem can survive a sustained effort against it.”

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PAPER TRAIL



Careful data management and ongoing testing are required to effectively validate ingredients.

By Jordan Tyler | jtyler@sosland.com

According to a recent joint report by Pet Food Institute, the Institute for Feed Education and Research and the North American Renderers Association, manufacturers in the United States spent \$6.9 billion on more than 8 billion tons of pet food ingredients in 2019. Validating these ingredients for food safety is a crucial part of the supply chain. Manufacturers and suppliers must manage and share an abundance of data to ensure they are sending safe product into the marketplace.

Thanks to the Food Safety Modernization Act (FSMA), current Good Manufacturing Practices (cGMPs), and a slew of commonly acknowledged best practices, the pet food processing industry is well-equipped to validate ingredients for food safety. While federal regulations do not specifically define the steps companies should take in validating ingredients, FSMA has imposed rigid guidelines for preventing animal food from being unsafe.

“Overall, the pet food industry has a good track record and plenty of processes and policies in place to ensure the production of safe, wholesome pet food to feed America’s growing pet population,” said Paul Davis, Ph.D., director, quality, food safety and education, and Louise Calderwood, director, regulatory affairs, American Feed Industry Association, Arlington, Va.

Whether a manufacturer is receiving raw material from a supplier or a supplier is purchasing raw material to process prior to supplying to a manufacturer, a paper trail of

various food safety standards, certifications and records are exchanged to validate ingredients at every step.

Setting high standards

Each pet food manufacturer maintains its own ingredient standards based on types of ingredients and finished product specifications, Davis and Calderwood explained. These standards are often influenced by federal standards, such as those by the US Department of Agriculture, the US Food and Drug Administration (FDA), as well as global benchmarks.

“Pet food manufacturers use their standards when purchasing ingredients and then the facility tests and verifies the ingredients — through quick lab tests, visual appraisals and smell — when they arrive at the mill to ensure they are up to standard, both from a chemical and physical standpoint, before taking receipt and unloading,” Davis and Calderwood added.

Typically, suppliers are required to provide a Certificate of Analysis (COA), which includes qualitative and quantitative specifications about the ingredient. Other documents related to ingredient procurement, handling and any processing that might occur before making it to the manufacturer may also be required at this point.

“Several verification steps are taken to verify ingredient information,” said Craig Grantham, director, business development, Pet Food Solutions, Mokena, Ill., which supplies

Gold Shield™ refined chicken fat to the pet food industry. “These include, but are not limited to, supplier verification audits, third-party lab testing and regular internal tests. All these items occur on an ongoing basis.”

Suppliers may be required to provide a safety data sheet (SDS), which is most helpful during transportation.

“Each product for each shipment needs to have a safety data sheet,” said Fred Molenaar, quality assurance manager, Zinpro Performance Minerals, Eden Prairie, Minn. “It’s a description of the product and any possible hazards – and these are more like hazards for humans that come with handling and shipment.”

Commonly used federal and global standards include Hazard Analysis Critical Control Point (HACCP), Safe Food/Safe Feed (SFSF) and FAMI-QS certifications.

“FAMI-QS is the international quality and feed safety management system for specialty ingredients for animal feed and pet food,” said Mike Wright, director of operations, business development, D&D Ingredient Distributors, Inc., Delphos, Ohio.

Molenaar said FAMI-QS released a new version of its standard, requiring suppliers to provide information on certain processes or treatments used before it is shipped to a manufacturer. For ingredients sourced internationally, FSMA requires manufacturers to go through a Foreign Supplier Verification Program (FSVP) to ensure food safety and quality compliance with United States standards.

An arsenal of testing methods are employed to test ingredients for moisture, nutrient composition and concentration, quality, adulteration, and other potential food safety risks.

PerkinElmer, Inc.

“Never assume ‘business as usual’ because unexpected variations and disruptions in supply chains do occur and can affect downstream ingredient and product characteristics.”

Mike Wright, D&D Ingredient Distributors

Many means to an end

Ingredient suppliers and manufacturers develop and follow their own procedures, which often account for specifications and requirements that are unique to that company and product, to provide consistency in their ingredient validation efforts.

“Before any ingredient is ever used, the supplier must pass our supplier approval process, as well as provide specifications and samples for us to evaluate to ensure the ingredient is up to our standards,” said Natalie Asaro, companion animal nutritionist, Petcurean, Chilliwack, British Columbia.

D&D Ingredient Distributors requires all suppliers to provide a letter of compliance and, in some cases, complete its supplier questionnaire and feed safety agreement, every two years. This applies to all supplier locations, including new facilities from which ingredients are sourced or processed, and ensures compliance with FDA regulations, such as for restricted use protein products, as well as with FSMA.

“Our suppliers are documented, reviewed, evaluated and approved by our supplier approval team prior to an ingredient purchase,” Wright said. “This team consists of seven members who come from production, operations, purchasing, formulation and quality.”

Petsource by Scoular, an Omaha, Neb.-based supplier of freeze-dried proteins for pet foods, uses a holistic risk assessment to validate ingredients.

“The assessment has several risk-based categories intrinsic to food safety and quality, including but not limited to microbiological risk, chemical risk, food defense and geographic location,” said Steven Moore, director, food safety, quality and innovation, Petsource. “Additionally, a review of the supplier’s food fraud and nutritional programs is included as a key category in the assessment.”

Some pet food and ingredient manufacturers will also





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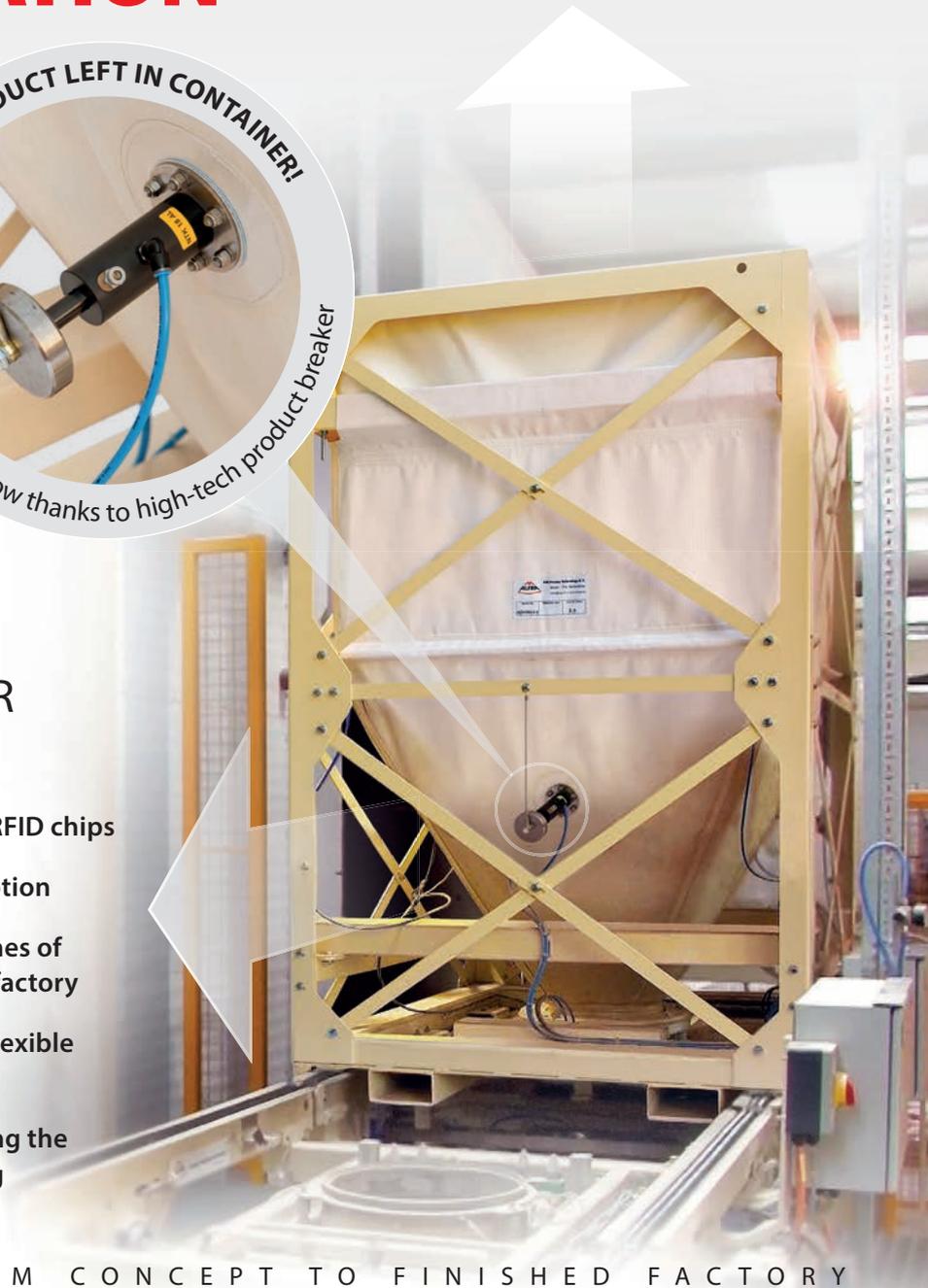


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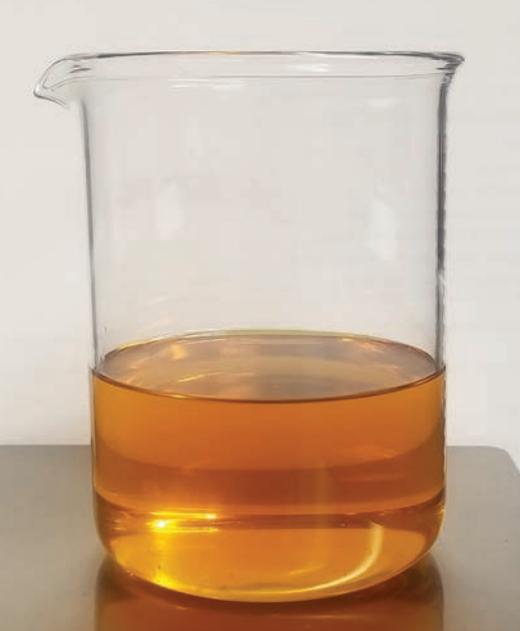


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Left: Pet Food Solutions purchases chicken fat and refines it before supplying to pet food manufacturers, which requires a keen eye for food safety and quality on both sides of the supply chain.

Pet Food Solutions

Right: Manufacturers typically require a Certificate of Analysis in addition to conducting their own assessments and validation measures, which vary from company to company and even from product to product.

D&D Ingredient Distributors

conduct or commission audits of their suppliers to ensure processing and handling procedures meet their own specifications. Of course, these certifications, audits and company-specific practices used to validate pet food ingredient safety all boil down to one thing: testing.

Testing, testing...

In-house and third-party tests are used by both manufacturers and suppliers to analyze ingredients for composition, pathogens and defects.

“We test all our products for impurities, including dioxins and PCBs because those are considered risks in our drying process,” Molenaar said. “We test every batch of our product that’s going out to customers ourselves and provide COAs for those depending on the customer requirements.”

Pet Food Solutions leverages its extensive testing experience to ensure its ingredients are of the highest quality.

“We are very particular about the raw materials we start with and have intensive protocols in place to ensure our quality from the start,” Grantham said.

“An initial review of a new ingredient generally includes receipt of a sample of material and a specification sheet,” he explained. “The ingredient sample is then lab tested at a third-party lab for those items listed on the specification sheet and other values that are of interest to our company. If an ingredient passes this inspection, supplier certification forms are required to be submitted.”

Wet chemistry lab testing is the most common way to validate ingredients. It includes the “full gamut of laboratory techniques to determine the elements and chemical compounds in an ingredient sample and their exact proportions,” Wright said.

“Wet chemistry is the original type of analytical chemistry consisting of time-consuming lab techniques, but it’s now even more accurate and faster with modern equipment, chemical reagents and computerized databases,” Wright explained.

Petcurean utilizes near-infrared (NIR) spectroscopy, a rapid testing method used to measure nutritional value,

such as fat and protein levels, as well as moisture content.

The use of digital microscopy is another quick way to validate ingredients visually for crystalline and other structural characteristics. This allows operators to compare new ingredient samples with images of ingredients that have already been characterized to meet a company’s standard.

“Some materials may look the same to the naked eye, have the same bulk density, and even have the same nitrogen content (which is a marker for protein),” Wright explained. “Yet, one may be a legitimate ingredient and the other may be a ‘foreign material’ or even an ‘economically motivated adulterant’ – that is, a very similar-looking but potentially harmful material incorporated to lower the cost of the ingredient.”

Setting the record straight

Keeping careful records and trending ingredient data over time is a common practice to ensure continued compliance. This is often done through digital databases and “scorecards” that allow manufacturers to track quality and food safety specifications from shipment to shipment.

At Petsource, each incoming ingredient has its own set of testing and validation procedures, Moore said, and results are uploaded to a supplier management software.

“The software creates a real-time scorecard showing completed and overdue items for each supplier and ingredient in our supply chain,” Moore said. “Data from assessments, audits, incidents, recalls, and incoming testing and receiving are automatically collated and incorporated in a configurable report, which triggers follow-up actions.”

Petcurean maintains scorecards for its suppliers based on COA data, other documentation and testing results. This allows the manufacturer to keep tabs on compliance over periods of time and even discontinue a partnership with a supplier if an ingredient’s performance continuously falls short of its standards.

“Even after receiving ingredients, manufacturers have safety checks in place throughout the manufacturing process to ensure the ingredients are safe, including

weighing the ingredients and testing batches,” Davis and Calderwood said.

For example, D&D Ingredient Distributors tracks all raw materials, ingredients and products by lot number.

“Each of the ingredients that go into blending products is tracked and reconciled each day to make sure first-in, first-out lots are used,” Wright said. “Our lot tracking system generates data that we can use to inform both our suppliers as well as our clients and customers.”

Pet Food Solutions also tracks its Gold Shield™ refined chicken fat to make sure performance, food safety and quality are on par with expectations throughout processing.

“We also use a third-party lab for more complex tests,” Grantham said. “We trend all lab data to ensure we can identify any changes in how our process may be running.”

The company tests all samples it receives and trends all its lab data over time to monitor potential variances and continued compliance.

On the flip side of the business, the company provides details on experiment design and raw specification data for the Gold Shield™ refined chicken fat it supplies to pet food manufacturers.

Challenges and solutions

Despite these measures, ingredient validation comes with some challenges. For example, the wide array of testing methods used to verify ingredients can lead to unanticipated discrepancies.

“While all labs endeavor to do their very best, some testing methods can be subjective,” Grantham said. “At times, there are also different methods used to test the same thing. These issues can lead to different results and confusion.”

Conducting regular testing and keeping records for comparison, as well as conducting in-house testing, if possible, to compare any third-party results, can alleviate this.

The other main challenge is measured by a factor of trust and reliability between suppliers and manufacturers. Wright explains that manufacturers are, to some point, relying on a supplier to present accurate information about its ingredients.

Maintaining strong, transparent, supplier relationships backed by consistent data and information sharing is key for a processor.

Playing it safe

Looking forward in the world of ingredient validation, Molenaar indicated ingredient testing will continue to be a focal point.

“If you look at human food or pharmaceuticals, that’s a big step of course, but it’s common practice to test every thing that comes in,” Molenaar said, suggesting testing methods and requirements will only continue to grow.

Attending industry events, educational conferences and

“As scrutiny increases on pet food ingredients, the industry can win by showing awareness and response.”

Craig Grantham, Pet Food Solutions

training sessions can also be helpful for processors and suppliers looking to fine-tune their ingredient validation procedures, as suggested by Grantham.

“As scrutiny increases on pet food ingredients, the industry can win by showing awareness and response,” Grantham said. “Finding real solutions that make our ingredients safer, healthier, tastier, cleaner and more efficient will create better brand value and benefits for both consumers and pets. Using technology — rather than chemicals — to achieve these benefits will be one way for companies to win, and we stand ready to support our partners in this pursuit.”

One thing is for certain: although there are several avenues and best practices at the global and federal level and from company-to-company, manufacturers and suppliers must take it upon themselves to validate the safety of each pet food ingredient.

“Pet food processors should continue to evaluate and audit their sources of ingredients periodically,” Wright concluded. “Never assume ‘business as usual’ because unexpected variations and disruptions in supply chains do occur and can affect downstream ingredient and product characteristics.”

PFFP

Raw ingredient shipments are often tracked in a continuous database to measure compliance and performance specifications are met from batch to batch and throughout processing.

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STAYING FRESH, STAYING HEALTHY



Antioxidants play different but important roles in pet food and treat formulations.

By **Donna Berry** | petfoodprocessing@sosland.com

Antioxidants are powerful molecules that serve two purposes in pet foods. The first is to keep the food fresh, mainly by preventing the fats and oils from going rancid through a process known as lipid oxidation. The second is to keep the pet healthy by preventing free radicals in the body from damaging cells and having a deleterious effect on various biological functions.

These two purposes for antioxidant addition may create confusion for vigilant pet parent label readers. The required nomenclature for antioxidants may also raise eyebrows.

“The Association of American Feed Control Officials requires all animal food to use consistent, approved names for each ingredient,” said Eric Altom, technical nutritionist, animal health and nutrition, Balchem Corp., New Hampton, N.Y. “An ingredient that contains strategic antioxidant properties may look like a non-natural material because of the required name.”

There are many sources and forms of antioxidants. Isolated antioxidant ingredients, for example, may be extracted directly from foods, such as ascorbic acid

(vitamin C) from citrus; however, it is possible to also replicate the structure of vitamins in the laboratory using chemicals, e.g., synthetic vitamins. Ingredient legends do not discriminate between the two.

Synthetic antioxidants, on the other hand, are just that. They are chemical combinations recognized as being cost-effective preservatives. Such ingredients often have complex chemical names, such as butylated hydroxyanisole and butylated hydroxytoluene.

Antioxidants may also be delivered through whole foods, namely fruits, vegetables and herbs. Extracts have also become quite common. These are concentrated forms neutralized for flavor and aroma.

Assisting with shelf life

Cats and dogs require fat in their diets and in greater amounts than humans. Fat not only provides energy, it is critical for proper cellular, hormonal and nerve function. It also contributes to the flavor and texture of the food, while keeping coats shiny.

Fats readily go rancid if not carefully protected. This

Antioxidants preserve the quality of pet foods and treats and help prevent products from becoming rancid.

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The two primary roles of antioxidants in pet foods and treats are protecting product quality and supporting animal health.

Corbion

is when they develop objectionable flavors and odors. There's no way to prevent it completely, only to slow it, and there's no recovery.

Fats degrade when fatty acids react with air, moisture or other compounds and break down into free fatty acids and other unstable compounds. Oxidative rancidity, also known as auto-oxidation, occurs in the presence of oxygen. Thus, the first step for delaying the inevitable is proper packaging and sealing.

Hydrolytic rancidity, also called hydrolysis or enzymatic oxidation, occurs in the presence of moisture and the absence of air. This normally is accomplished through enzymatic peroxidation, where enzymes found naturally in plant oils and animal fats catalyze reactions between water and oil.

A third type of fat degradation is microbial rancidity which occurs when enzymes from bacteria, mold or yeast break down the fat. Such excessive microbial growth usually visually renders the food inedible.

Higher temperatures, light, water, metal ions and biological catalysts may accelerate reactions. The presence and placement of unsaturated fatty acids on the fat molecule also influences the rate of degradation. Thus, fat selection comes into play when taking steps to delay degradation.

In general, the more polyunsaturated fatty acids on a fat molecule, the faster it will go rancid. This is due to the unstable double bonds that participate in the various degradation processes. Antioxidant systems containing different combinations of natural phenols, vitamins and organic acids may prevent or slow oxidation.

Fat degradation is an issue in all types of pet foods, with longer shelf life products such as dried kibble and jerky-style snacks being the most affected. But it is not just the inherent fat in meat, or the bulk oils added to recipes that may go rancid; specialty, better-for-pet ingredients

containing polyunsaturated fatty acids are very unstable and highly prone to oxidation. This includes ingredients such as Omega-3 fatty acids, whole grains and nuts.

"Oxidation is a hot topic in the pet food industry," said Robb Caseria, managing director, Videka LLC, Kalamazoo, Mich. "Finding the antioxidant system that will preserve a pet food's sensorial and nutritional properties throughout its shelf life is often a headache for pet food manufacturers."

Auto-oxidation – a chain reaction

Auto-oxidation occurs in three stages, with the first being the initiation. It is here where molecular oxygen combines with unsaturated fatty acids, producing hydroperoxides and peroxy free radicals, both of which are highly reactive and unstable. The second stage is called propagation and occurs when these unstable by-products of the first stage react with other lipids. This starts a chain reaction, with the reaction supplying its own acceleration.

At this point there is no turning back for the fat, as it is in a continuous cyclical oxidative degradation process that will only end upon the final stage, which is aptly known as termination. This can occur when the free radicals become highly concentrated and begin to react together, and by doing so, stop further reactions.

"Finding the antioxidant system that will preserve a pet food's sensorial and nutritional properties throughout its shelf life is often a headache for pet food manufacturers."

Robb Caseria, Videka LLC

Termination can also occur when reactions yield unreactive compounds, thus preventing further propagation. Reactions will also cease when an antioxidant enters the scenario. But at this point, any degradation that has already occurred is permanent. The fat cannot repair itself.

If objectionable flavors and odors have developed, they will remain. Initial rancid notes come from the secondary products produced during the initiation stage of auto-oxidation. When the peroxides eventually break down, they decompose into various aldehydes, ketones

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“Research shows each antioxidant benefits the immune system uniquely, so one antioxidant at high levels is not as effective as a group of antioxidants acting together.”

Eric Altom, Balchem Corp.

and acids that exert additional, and typically more putrid flavors and odors.

“An oxidized pet food will be perceived by pet owners as a sign of poor quality, or even a danger to their animal’s health,” Caseria said. “And actually, they are not completely wrong. The altered chemical structure of lipids makes them less bioavailable for the animals. So even though oxidation won’t harm a pet, it can certainly damage the food’s nutritional value.

“Limiting oxidation is crucial to preserve the shelf stability and nutritional quality of a pet food,” Caseria said.

Adding antioxidants

The most common approach to inhibit lipid auto-oxidation is to include antioxidants in the formulation. This is often done throughout the supply chain, particularly with kibble manufacturing.

“Choosing the right place and the right moment for their addition is crucial,” Caseria said. “Antioxidants should be added as early as possible, as well as regularly throughout the manufacturing process.”

The fight against oxidation commonly starts at the renderer’s plant, where antioxidants are added in with the raw materials used to produce the fats, oils and meals that will go into the kibble.

“Additional antioxidants may also be added directly to the final meals and oils by the renderer prior to packaging,” Caseria said. “The fight then continues to the pet food manufacturer’s plant. When meals and oils are stored for a long period before being processed, or if they have not been stabilized at the renderer’s facility, pet food manufacturers may add antioxidants to protect them during extrusion.”

For extra protection with kibble and dried snacks, antioxidants may be sprayed on sealing each piece to ensure lipid preservation throughout the product’s shelf life.

Traditional synthetic antioxidants are very effective, easy to use and low cost. However, being chemically derived, they are undesirable in today’s clean label environment. In response, formulators are embracing clean label antioxidants, with the most common options classified as tocopherols (vitamin E) and high-phenolic plant extracts.

“Chemical antioxidants are liabilities in the clean label movement,” said Robert Ames, senior business development manager, Corbion, Lenexa, Kan., which markets natural antioxidants.

Kerry Courchaine, director of technical services, Darling Ingredients, Irving, Texas, said, “Where natural antioxidants were once only requested by premium and super-premium pet food brands, we now receive natural requests from mid-market pet food brands.”

Mixed tocopherols and botanical extracts are added to many of Darling Ingredients’ rendered products for pet food formulating.

“At times, a rendering plant may choose to use a natural chelator, such as citric acid or ascorbic acid, to bind free-radicals when rendering challenging raw materials with the potential for high ash content, which might otherwise promote oxidation during the rendering process,” Courchaine said. “Our facilities use a variety of natural antioxidant formulas, whether specified by a customer, or necessary due to some unique challenges of the rendered products.”

The technical team constantly monitors each pet food ingredient facility to determine the best natural option available to prevent oxidation. In recent years, a poultry industry trend has been to move toward all-vegetarian diets for their birds.

“These diets translate to higher levels of unsaturated and polyunsaturated fatty acids, which are more prone to oxidation,” Courchaine said. “The move away from rendered by-product meals toward more label-friendly rendered proteins, such as chicken meal and turkey meal, exacerbates the oxidation problem. These meat meals tend to be higher in ash, a source of oxidizing free radicals, such as copper and iron.

“Chicken meal and turkey meal are also the products of such raw materials as edible necks, backs, frames, skins, and bone residue from deboning operations,” she said. “These raw parts harbor strong oxidizing agents, such as chlorine and peracetic acid, used in carcass rinses.”

Altom added, “To ensure proper shelf life and long-term stability, it is critical to control the oxidative-reduction reactions. One way to support this foundation is to provide organic trace minerals. These are minerals

Ingredients’ antioxidant properties are commonly called out as health benefits of the product on pet food packaging.

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“Knowing where in the process to add antioxidant, how much to add and what antioxidant to use are critical to understanding how to stabilize pet foods.”

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bound to a ligand, a protein or amino acid, which reduces the antagonistic effects in a diet matrix and increases mineral bioavailability. By limiting the reactive capabilities of metals, you can help reduce substrates available for destructive reactions.”

In high-meat and fresh-meat pet foods, microencapsulated acidulants help with stability.

“These acidulants, such as lactic and citric acids, may be derived from natural fermentation processes,” Altom said. “Through the strategic use of microencapsulation, we are able to better control the pH of the total matrix. By reducing the pH of the matrix, we can create a hurdle for bacteria growth, prevent loss of moisture and natural flavonoids, and support more shelf-stable products.

“Many natural antioxidants can be pH sensitive for optimal performance,” Altom continued. “Therefore, leveraging an encapsulated acidulant may help enrich the environment and help maintain optimal performance of antioxidants.”

Kemin Industries, Des Moines, Iowa, has varied options to support pet food companies in assuring product freshness. In addition to producing time-tested synthetic antioxidants, the company has actively been involved in the antioxidant shift toward natural plant-based options. This includes mixed-tocopherols and plant-based extracts.

“Knowing where in the process to add antioxidants, how much to add and what antioxidant to use are critical to understanding how to stabilize pet foods,” said Jim Mann, senior global product manager with Kemin Nutrisurance’s Antioxidant and Food Safety Platform. “As pet food formulations change and use novel ingredients and more unsaturated fats, this can become more challenging and can require extensive testing and collaboration with antioxidant suppliers to identify the best antioxidant stabilization strategy.”



Antioxidant usage in shelf-stable wet foods is very different than with kibble. It gets even more complicated with refrigerated fresh products.

“Antioxidants can be added to the meat ingredients to help maintain their high quality and palatability,” Mann said. “In addition, antioxidants can potentially help with color retention and palatability of canned food.

“The oxidative stability of fresh and frozen food, or even freeze-dried food produced from fresh or frozen meats, is often overlooked,” he said. “Adding the appropriate antioxidant during emulsification or prior to freezing can help protect the quality of these products. Antioxidants can extend their shelf-life and maintain palatability if added early in their manufacturing process.”

For quality of life, too

In addition to ensuring product quality, antioxidants help maintain quality of life. The antioxidants for this purpose are generally those found in fruits and vegetables. Common antioxidants include vitamin A, vitamin C, vitamin E, and certain compounds called carotenoids, such as lutein and beta-carotene. They may be delivered in pet food through the addition of fruit and vegetable ingredients, including powders, concentrates and purées. The antioxidants may also be added in the form of isolated ingredients.

“Research shows each antioxidant benefits the immune system uniquely, so one antioxidant at high levels is not as effective as a group of antioxidants acting together,” Altom said.

Jeannie Swedberg, director of business development, Tree Top Inc., Selah Wash., said, “Powerful antioxidants contained in these ingredients can help the body — human or animal — fight free radicals. Free radicals are highly reactive, oxygen-containing molecules that can damage cell membranes and enzymes, which makes the nervous and immune system especially vulnerable. Free radicals are considered factors in disease progression and premature aging.”

Free radicals result from oxidation, a natural process that occurs during digestion, exercise or simply breathing. They are produced in greater than normal amounts when pets are sick, elderly, exposed to pollution or suffer from poor nutrition. The more free radicals in the body, the greater the potential for irrevocable damage. That’s because once free radicals form, they can start a chain reaction, damaging healthy cells, which in turn can contribute to various afflictions. Antioxidants terminate these chain reactions by being oxidized themselves, thus preventing free radical damage.

The right amount or combination of antioxidants in pet food may assist with easing the pains and signs of aging. They help build immunity and temper allergies while also supporting overall health and wellness in pets.

“Nutritionally supporting the immune system may be especially critical for young animals,” Altom said. “In puppies, for example, the immune system is still developing at the time it is being challenged with vaccinations and exposure to disease-causing agents. With the addition of antioxidants, a high-quality puppy diet can aid in the development of a strong immune system to help maintain good health and protect against viruses, bacteria and parasites.

“Recent research also examined the effect of aging on immune responses,” Altom said. “The findings indicate that as dogs and cats age, immune cell responses may decline. Including antioxidants in the diet can reverse the age-related decrease in immune cell function.”

Fruits and vegetables not only help meet a pet’s dietary needs, they also supply great tag appeal. “Front-of-packaging panel promotion or call-outs about the benefits these ingredients provide will attract the attention of caring pet parents,” Swedberg said.

As premium pet foods and treats continue to be popular and contain an increasing variety of proteins, fats and healthy ingredients, protecting those formulations will remain a challenge for processors, requiring close attention to antioxidants.

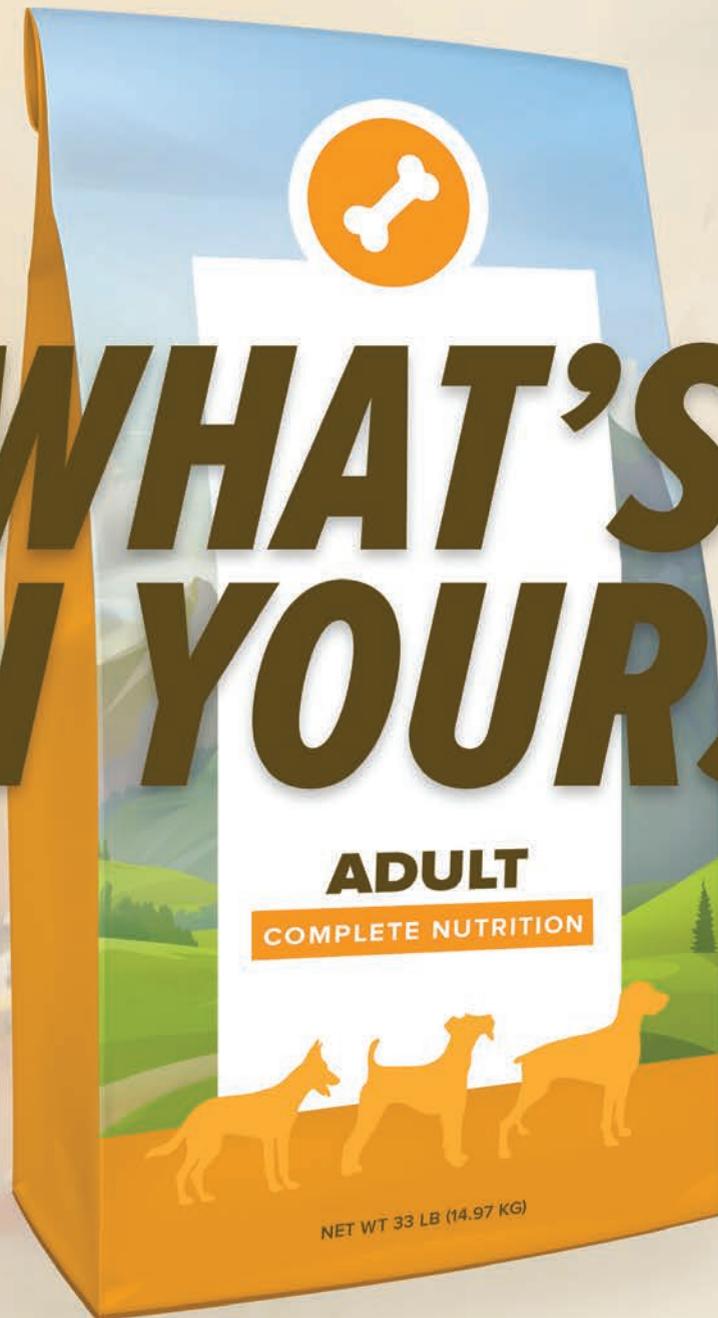
From a nutritional perspective, antioxidants support a formulation’s ability to maintain good health and protect against viruses, bacteria and parasites.

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COLD-FORMING

possibilities

A look at cold extrusion applications common in the pet food industry.

By Keith Loria | petfoodprocessing@sosland.com

There are numerous cold extrusion applications in the pet food industry that can be broken down into different segments such as products (animal feed, treats, supplements and medicines), formats (fresh, shelf stable, wet, semi-moist, dry, freeze dried or dehydrated), and shapes (kibble, balls, chubs, cubes, coins, strips, bites, sticks and bones).

“Cold extrusion is applicable for a wide variety of animal and pet feed, treats, supplements and medicines,” said Jeff Zeak, pet food and treats application specialist for Canton, Mass.-based Reiser & Co., Inc. “Cold extrusion is very useful when additive ingredients are sensitive to heat as can be the case with some types of supplements, vitamins, minerals and medicines.”

Eric Altom, Ph.D, technical nutritionist, animal health and nutrition for New Hampton, N.Y.-based Balchem Corp., explained cold extrusion is primarily leveraged to properly mix and form products prior to a final cooking and/or drying step. This may be a cold, co-product extrusion with two components combined into a single product or a treat with high fresh meat content.

“Cold extrusion is necessary in the use of fresh meats in treats and dietary supplements,” Altom said. “High fresh protein treat products can be a challenge in product development. These products usually contain very high concentrations of meats, and meats are highly susceptible to oxidation (proteins, amino acids, fats, and fatty acids). Leveraging organic trace minerals to limit metals from

being available for chemical reactions, and using encapsulated acidulants to better control pH, can help as a foundational part of the shelf-stable platform in cold formed products cooked via smoke houses.”

Proteins, amino acids, fat, and fatty acids are highly susceptible to degradative reactions prior to cooking. When added to the matrix and thermally processed, the encapsulated acid is released, thereby reducing the pH of the matrix.

“Certain microbes and pathogenic bacteria cannot survive and/or replicate at low pH concentrations,” Altom said. “This pH reduction will control microbial populations by providing a stable, targeted pH level in the material. Encapsulated acids are encapsulated to prevent any pre-reactions with the matrix’s composition, whether that is protein denaturation (otherwise known as shocking or acid shock), purging of moisture, or discoloration/off-flavors.”

Tim Spannbauer, engineering services manager for Handtmann, which manufactures vacuum stuffers/formers used to extrude pet foods and treats, explained the company’s role with cold extrusion pet food processing is focused in two areas: mixing and emulsifying with smart technologies by Inotec, and high volume extruding with its vacuum fillers and multilane extruding solutions.

“The cold processing of pellets is a growing segment because of the public’s concern for the quality and nutritional content of the kibble, bites and treats they are

After cold-extrusion, products can be cut or diced into different shapes and sizes based on customer specifications.

Urschel Laboratories, Inc.





“From start to finish, it takes up to 15 different pieces of equipment to produce a finished product through cold extrusion.”

Preston Munsch, PetDine LLC

Cold extrusion is growing in popularity as consumer preferences shift toward products processed at lower temperatures to maintain nutritional value.

Handtman

feeding their pets,” he said. “So, the ability to manage critical formulation parameters in the mixing and/or emulsifying processes is becoming more and more important, and exactly hitting those parameters from batch to batch is now also critical to brand management.”

Mike Jacko, vice president of applications and new product innovation for Chesterton, Ind.-based Urschel Laboratories, Inc., said the company’s equipment is an integrated part of the formulation process before extrusion, as well as reduction of the formulated product after extrusion.

The Comitrol Processor line of Urschel milling equipment effectively reduces these ingredients down to micro-dimensions without significantly increasing the temperature to preserve nutritional value.

“With pet food we take fish, chunks of pork, beef, poultry and other ingredients including bone matter and size reduce the proteins into emulsion small enough so the extruder nozzles will not clog-up,” Jacko said. “After the extrusion process, Urschel dicers/slicers produce shreds, slices or dices based on customer objectives. Sometimes we take whole muscle liver or lung and dice for freeze-dried pet snacks.”

Preston Munsch, chief executive officer of Fort Collins, Colo.-based PetDine LLC, which specializes in the production of functional soft chews through cold extrusion, noted its process not only avoids the use of heat but also uses no water.

“With the introduction of water, you add an additional element of risk with the potential growth of yeast and mold,” he said. “In order to control that you have to use a fairly aggressive level of preservatives to maintain a 24-month best-by date. Water is often used to hydrate or ‘activate’ gumming agents that are commonly found in soft chews. For these reasons, we avoid both water and heat to make the cleanest and most safe product possible.”

“Cold extrusion is ideal for these products as it eliminates any barriers that may negatively affect the performance of the product such as heat or water,” Munsch said.

“We have invested heavily in the development of our cold extrusion production lines, which include many custom pieces of equipment. From start to finish, it takes up to 15 different pieces of equipment to produce a finished product through cold extrusion.”

Equipment matters

Zeak noted some important equipment in cold extrusion includes an AMFEC paddle and ribbon blenders, Seydelmann bowl cutters and mixer grinders for mixing ingredient materials for extrusion purposes.

“In-line grinding systems can be inserted into the extrusion machinery process to modify the appearance and texture characteristics of the finished product,” he said. “Hard-particle and bone-separation equipment features can be added to extrusion grinding systems in order to remove hazardous particles to make the resulting product safer for consumption. Artery particles in pet foods and treats become very sharp once dried.”

Additionally, AMFEC vacuum tumbler massagers and Famaco injectors are used for yield improvement of ingredient materials prior to extrusion. Vemag vacuum extrusion systems are used for reduction of air in extruded product and increasing density of product during forming of chubs and link shapes.

“Single- and multi-lane shape and ball forming attachments can be added and interchanged on the front of the Vemag extruder for creating a variety of sizes and shapes,” Zeak said. “Holac slicers and dicers can be used for further processing of extruded product for shape formatting.”

Sam Pallottini, director of pet sales for Reading Bakery System, an equipment supplier in Reading, Pa., noted the company’s Low Pressure Extruder (LPE) utilized for pretzel equipment is a perfect machine for producing baked pet treats. The design enables the company to push stiffer doughs through a die to produce a wide range of shapes and has been used to co-extrude treats as well.



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“Coextrusion is the most common application into an oven for developing a two-dough type pet treat,” Pallottini said. “Coextrusion for pet treats normally requires a similar inner filling and outer jacket in order to create a nice-looking product. If you do go with a jelly-type inner filling, this needs to be heat stable in order to prevent bleeding.”

Mark Martin, test lab supervisor for Urschel Laboratories, said Urschel cutting machinery can produce clean-cut strips and dices and irregular shaped strips and shreds, which is achieved with a series of rotating spindles.

Spannbauer said the adjustable vane cell design of the Handtmann vacuum filler is well suited to cold extrusion because, among other reasons, friction is reduced with the product path being much shorter than with auger systems.

“Handtmann fillers also operate very efficiently at -2 C to +5 C, and minimize temperature rise to help maintain consistency and quality,” he said.

Additionally, Handtmann Rotary Cutting Systems for pet food offer knife and wire cutting options in configurations up to 24 lanes and speeds up to 1,440 cuts per minute. Handtmann Multi-lane extruding solutions produce dimensionally stable kibble and treat products with gram-sensitive accuracy across all lanes at up to 250 cuts per minute.

Unique challenges

Cold extrusion formulating and processing for pet food and treats does not come without some issues, Zeak shared. Challenges can include the temperature of material being extruded, which can affect the viscosity or consistency of the product and its ability to hold its own shape, thus impacting the performance of the machinery and the extrusion process. Extremely viscous formulations can be difficult to feed into the double screw and bridging can occur with just gravity alone.

Spannbauer noted as well that a key challenge is getting and keeping the material stiff enough through the entire process so it can form and maintain shape.

“Having equipment that can distribute binders evenly and efficiently to thicken up the filling material is important, as is the ability to accept CO₂ snow and distribute it efficiently to chill product to optimal levels for forming,” he said. “Creating reliably homogeneous batters is important to keep the smaller extrusion ports open and production moving.”

Altom noted product stability and moisture loss in fresh meats prior to processing can also be a challenge.

“This is because of a potential delayed time between



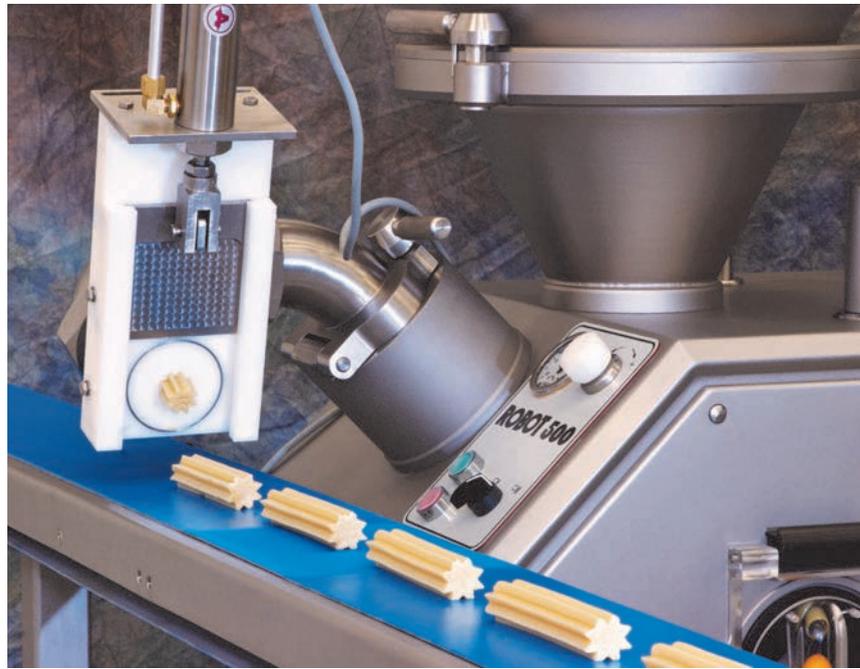
Managing temperature throughout the cold-forming process ensures product is not too stiff to run smoothly through the extruder. Reiser

batching, extrusion, and the final cooking step of the total process,” he said. “Therefore, specifically designed micro-encapsulated ingredients can help deliver the best options for product stability to ensure the fresh meat.”

To support proper shelf life and long-term stability for various cold extruded products, Altom noted it is critical to control numerous oxidative-reduction reactions in the products prior to the final steps.

“One way to support this foundation is to provide organic trace minerals, which are minerals bound to a ligand (protein or amino acid), thus reducing the antagonistic effects in a diet matrix and increasing mineral bioavailability,” he said.

Cold extrusion can be challenging depending on the goals of the formula and the target nutrients being delivered in the finished product, but those processors that embrace cold extrusion open up a broad range of innovative product possibilities. **PFF**



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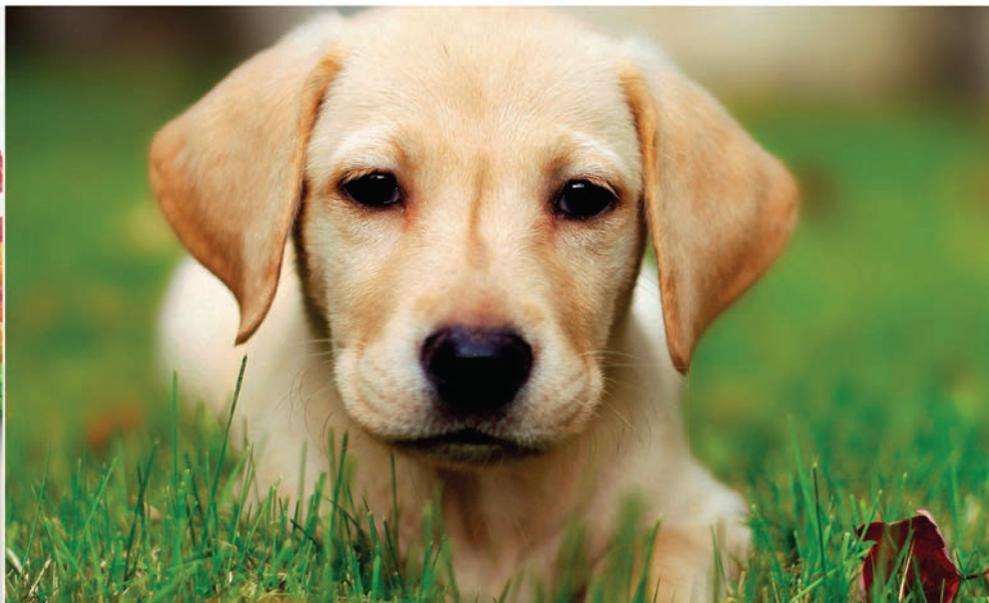
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EVERY
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Equipment innovations and automated process controls are facilitating safer, more efficient dry bulk ingredient handling.

By Richard Rowlands | petfoodprocessing@sosland.com

Dry bulk material handling refers to the movement, processing, measurement and storage of dry ingredients or finished dry products that are handled in bulk. Refining this process enables pet food and treat processors to handle dry bulk materials with greater accuracy, efficiency, reliability and safety.

“Dry bulk material handling ranges from storage of product ingredients to material movement and feeding, material size reduction, weighing, mixing, drying, movement or transport and other processes,” explained Joe Lewis, marketing, Sterling Systems & Controls, Inc., Sterling, Ill. “In addition, dry bulk material can be a powder or granular material of a wide range of sizes. The dry bulk material can have a range of physical properties that need to be considered when storing or processing the material.”

Handling options

Thanks to the wide variety of materials used in pet food and treat processing, it is necessary for processors to utilize a diverse range of dry bulk material handling systems.

“Depending on the material and part of the process, you will see just about every type of conveying media out there: bucket elevators, bucket conveyors, screw conveyors, slat conveyors, food grade belting, plastic modular belting, vibratory feeders and pneumatic conveyors,” said Pete Ensich, chief executive officer, WEM Automation, LLC, New Berlin, Wis.

Zach Turner, sales engineer, food, AZO, Inc., Memphis, Tenn., highlighted the unique benefits of mechanical and pneumatic conveying.

“The most common options with regard to ingredient delivery are mechanical conveying and pneumatic conveying,” Turner said. “The former is known for its ability to keep blends together and gently move products, while the latter is preferred for its cleanliness, efficiency and low-maintenance operation. At a high level, two types of pneumatic conveying are vacuum and pressure. While each of these has its pros and cons, there’s usually a way to appropriately convey products that are granular or powdery in nature.”

Other types of equipment that handle dry bulk materials include ingredient batching systems, bulk bag packaging systems and bulk bag unloading or discharging systems.

“Batching systems can include semi-automatic and automatic ingredient batching systems,” Lewis said. “Batches can be fed into containers for manual transport to a mixer or can be automatically transported to the mixer by pneumatic or mechanical means. Bulk bag filling systems are those pieces of equipment that bag a typically finished product in flexible intermediate bulk container (FIBC) bags.

“Bulk bag unloading or discharging systems can include everything for the simple discharging of bulk bags into transport hoppers, to include weighing, tramp

Automated bulk batching systems offer improved process efficiency and food safety by reducing the potential for human error, product loss, inconsistencies and cross-contamination.

AZO, Inc.



metal magnets for metal extraction, dust collection, hoists, bag massagers to promote emptying of bags, and also to include smaller bag packaging,” Lewis explained. “Often bulk bag unloading is incorporated into ingredient batching systems directly.”

Challenges of dry bulk material handling

The full-bore valve passage of aseptic valves ensures a high flow rate of the media for hygienic process sequences and cleaning cycles.

Festo

The proliferation of ingredients in the pet food and treat industry has exponentially increased the challenges associated with accurately and safely handling all of those ingredients.

Sosland Publishing Co.

The handling of dry bulk materials presents pet food and treat processors with a number of challenges that must be addressed.

“Many manufacturers have SKUs with dozens of ingredients, presenting the challenge of how to handle so many different minor/micro ingredients,” Turner said. “How do I consistently staff manual weighing of 40 to 50 ingredients each and every shift? Can this many ingredients be automated? If we automate them, can we ensure they will be accurately fed into the process? What about cross-contamination between products? These are challenges we routinely address with AZO technology.”

Lewis said some challenges are related to the physical handling of the material including the material density, flow characteristics, cohesiveness, the hygroscopic nature of the material and other considerations.

“Challenges also include the accuracy of feeding dry materials as ingredients into batches, and record keeping of batches and ingredients,” he said.

Steve Bain, industry segment manager, food and

beverage, FESTO Corporation, Islandia, N.Y., emphasized the challenge of maintaining food safety when handling dry bulk materials.

“Maintaining food safety during the entire transfer process can be difficult,” Bain said. “Bulk transfer often has considerably more surface area and potential contamination points than other processes. Many older systems aren’t designed with food safety as a primary concern.”

“Bulk transfer often has considerably more surface area and potential contamination points than other processes.”

Steve Bain, FESTO Corporation

Ensch agrees that food safety and cross-contamination are major concerns for pet food and treat processors.

“Over the past several years, the proliferation of ingredients and finished product SKUs have led to the need for improved controls to prevent cross-contamination and cycle cleanouts,” he said. “In some cases, this can be done by using flush materials, other times manual cleaning of equipment, or even automated clean in place (CIP) equipment and processes are used.”

Productivity and speed are additional challenges that processors must address in order to maximize efficiency.

“Like many manufacturing processes, there are design conflicts such as the need to move product really fast without damaging it in the process,” Enscht said. “The number of ingredients and subprocesses in a pet food facility require a great number of different conveyor media. That is why you see so many different material handling solutions applied.”

Modern dry bulk material handling equipment helps address these challenges in a number of different ways. One example is ingredient batching systems that automate batching control.

“Ingredient batching systems eliminate the inaccuracies of manual batching, increase batching throughput and production cycle times and enhance product safety through material traceability and lot tracking,” Lewis said. “Integrated controls can be designed to be easy to use, can include remote supervisory control and can integrate with corporate ERP [enterprise resource planning] systems.”



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“The number of ingredients and subprocesses in a pet food facility require a great number of different conveyor media.” Pete Ensch, WEM Automation, LLC

In fact, many of the improvements in bulk material handling technologies and equipment are related to automating certain processes.

“With the advent of Industry 4.0, vast amounts of data are available and collected through the control system in real time,” Ensch said. “The automation can make decisions based on preconfigured algorithms to divert contaminated or adulterated product. The ability to do so can reduce scrap and the cost associated with post-production inspections.”

Turner added that automating minor and micro ingredients can help mitigate or eliminate risks associated with insufficient staffing, inaccurate batching and accidental cross-contamination.

Careful selection of components can also help address food safety challenges.

“Many bulk material handling machine builders are actively upgrading components with food safety in mind,” Bain said. “In particular, using stainless steel or corrosion resistant materials and components with NSF-H1 grease and FDA-approved polymers should all be considerations.”

Plant efficiency and product quality

Dry bulk material handling systems can have a huge impact on overall plant efficiency and product quality.

“Any time there is a transfer of material from one material handling system to another or one process to another, there is always the chance of lost or damaged material,” Ensch explained. “Product that falls between processes is lost material and needs to be disposed of. It leads to inventory variances and cost because it usually involves labor to deal with housekeeping and disposal services.”

One way in which pet food and treat processors can increase processing efficiency is by implementing preventive maintenance plans.

“Having good preventive maintenance procedures that include maintaining your conveyors and smooth transfers can greatly improve the plant’s overall efficiency,”

Ensch said. “Oftentimes, material handling systems are overlooked and not proactively addressed, leading to unscheduled downtime.”

Food safety best practices

Turner highlighted the effect of automation on plant efficiency and the safety of the end product.

“Plants that implement minor/micro automation experience significant reduction in costs associated with scrap and rework of products that fell victim to typical mistakes and oversights of manual processes,” he said. “The food is safer, the production is faster and the facility is cleaner.”

Bain suggested compressed air used in pneumatic conveying should not be overlooked.

“Pay attention to compressed air quality for dense-phase pneumatic conveying systems,” Bain said. “If you consider the compressed air to be an ingredient, or at least a potential food safety hazard, then it’s important to ensure that food or food ingredients are not contaminated with unlawful indirect food additives. In addition to the air quality, ensure any valves or control systems are also meeting food quality requirements if these processes are deemed potential hazards. Utilizing aseptic valve technologies such as the VZQA pinch valve can help substantially in this effort.”

Mettler Toledo, Columbus, Ohio, a supplier of product inspection equipment, manufactures Gravity Flow (GF) metal detectors that help improve food safety.

“As product falls freely through the metal detector’s inspection zone, the unit detects metal contaminants and the contaminated portion of the product is quickly segregated from the main product flow and removed,” explained Sarrina Crowley, marketing communications manager, Mettler Toledo.

Automation also plays an important role in ensuring food safety and product quality.

“In addition to picking the right conveyor technology and selecting the right food grade materials, design automation and control can be a major part of best practices around food safety,” Ensch explained. “With consumers demanding a wide variety of pet food, it is more and more important to not inter-mix or cross contaminate materials. Automation control systems can be programmed to

Intelligent air monitoring systems provide compressed air usage data, an alarm when there is a leak, and lower air consumption when the process is in standby.

Festo



Dry bulk storage and batching systems solve a number of handling challenges associated with material density and flow characteristics. Sterling Systems & Controls, Inc.

prevent materials from becoming cross contaminated or automatically run a flush or cleaning sequence.”

Advancements in technology

Dry bulk material handling systems are continuing to evolve as new technologies become available.

“We’re seeing much more demand for sensors and monitoring as companies move toward Industry 4.0,” Bain said. “...Intelligent technologies including compressed air monitoring systems are becoming much more prevalent in the bulk material handling industry.”

Lewis said automation and data management technologies are also evolving as regulatory requirements for safety and traceability continue to increase. High demand for innovative pet foods and treats ensures automation and data management requirements for bulk material handling solutions will continue to grow. **PFP**



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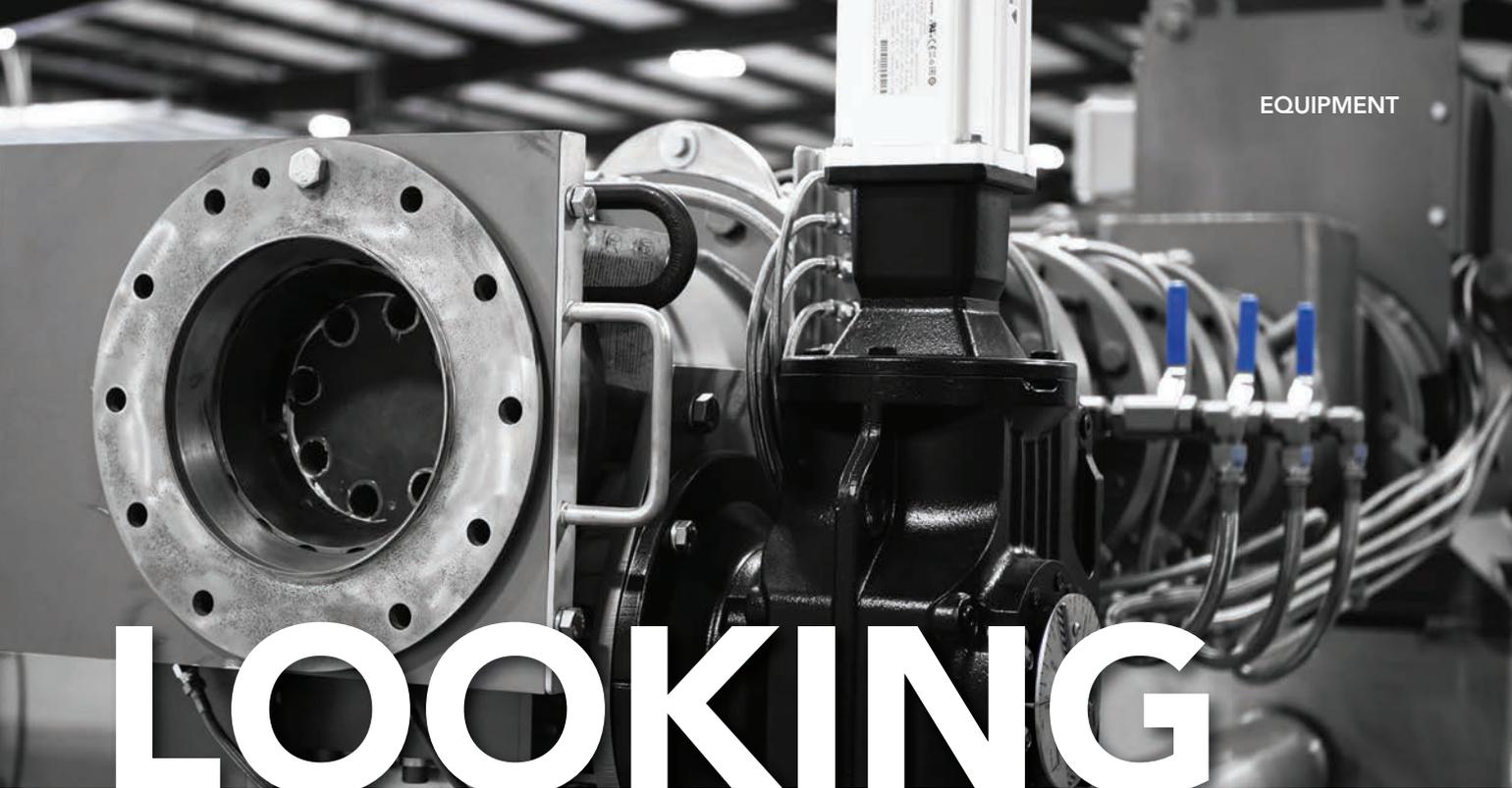
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LOOKING

down the barrel

At the end of an extruder barrel, form and function are equally important.

By Chris Crawford | petfoodprocessing@sosland.com

For pet food and treat processors interested in options for the end of the extruder barrel and how these affect product and process applications, suppliers offer their thoughts and products to best suit manufacturers' needs.

End-of-extruder experience

The extruder takes a stream of perishable and indigestible raw materials and “cooks” it into a highly digestible and shelf-stable food source, said Will Henry, director of research and development for Sabetha, Kan.-based Extru-Tech Inc.

The process transforms the initial ingredients by mixing and shearing them into gelatinized starch and denatured proteins, and adds texture and flavor, explained Dave Carney, area sales manager, pet food and aqua feed, North America, Bühler, Cary, N.C.

“The exit drives expansion with flashing of steam, and shapes are created with the die inserts,” Carney said. “The variable factors of temperature, specific mechanical energy, liquid addition and screw elements all affect the shape and consistency of the product.”

The end of the extruder houses an assembly of concentric devices to form the product, Carney added.

“The parts include the end plate, distribution body, diffuser plate and die plate,” he explained. “The die plate has die inserts to form the desired extruded shape.

Coextruded treats would not have the diffuser plate as it can deliver up to 20 multiple streams depending on machine size.”

Extruders come in single-screw and twin-screw options. “Pet food kibble is commonly made on single-screw extruders,” Carney said. “Twin-screw extruders provide a better mix of ingredients and often make more complex shapes and designs.”

Alan Kirkland, engineering manager, Ever Extruder, Festus, Mo., said the cooking process with a single-screw extruder is one of the most efficient and fastest processes, and the final die plate cavity shape determines the kibble shape, whether it be a round or a more detailed shape.

When discussing treats and end-of-barrel equipment, processors are generally limited to short-good treats (less than an inch) that are cut immediately after the die, said Daniel Tramp, technical sales, companion animal division, Wenger Manufacturing Inc., Sabetha, Kan. Items longer than that are typically allowed to cool before cutting, he added.

A unique system that can be used for long-goods treats is that of a twist die.

“This system allows for ropes of extruded product to be twisted to create unique shapes and texture — similar in shape to Twizzlers licorice,” Tramp said.

Adrian Martinez-Kawas, Ph.D., international project

Components, such as an EMV attachment, can be added to the end of an extruder barrel to ensure food safety upon start-up and give operators more control over product flow.

Extru-Tech Inc.

MUENSTER MILLING CO.'S EXTRUSION PROCESS

Muenster Milling Co., Muenster, Texas, uses a single-screw Wenger extruder to create its pet food products, said Chad Felderhoff, director of operations.

“Our pet food starts its journey in a flour form, meaning that everything has been ground into a fine flour so that the particles are around 3/64 of an inch in size,” he said. “After being ground into a fine flour, the pet food then makes its way to the conditioning cylinder, which combines steam and water to create a slurry type product.”

This slurry then is moved by the conditioning cylinder to the inlet throat of the extruder, Felderhoff said. The pet food is then introduced to the single screw and begins moving down the multi-flighted auger.

“The different flights of the auger slow and speed up the process of moving the pet food through the extruder,” he said. “These different flights and contours are what creates the immense amount of pressure that breaks down the carbohydrates in the flour and causes them to gelatinize.”

The pet food then moves to the end of the extruder, commonly referred to as “the head of the extruder,” Felderhoff explained.

“There are many various attachments at the head of the extruder that help to shape the product you see on the store shelves,” he said. “We use an Ever Extruder valve to help us control the pressure and cook of the product. The purpose of this valve is to act as a restriction plate and slow down the amount of product that is allowed to reach the die plate. If we need to get more cook, then we increase the restriction on the valve, and if we need less cook, we open the restriction on the valve,” Felderhoff said.

After the product moves through the valve, it then moves to the die plate.

“The die plate is also a very crucial part of the extruder, and the makeup and the nature of the build of the die plate plays a crucial role in how the product looks when it exits the extruder,” Felderhoff said. “The die plate typically has cutouts of shapes that are placed evenly around the die plate. The die plate shapes the pet food into a cylindrical or rectangle form.”

After the product passes through the die plate, it is met with the knife setup.

“The knife setup that we use is the patented Ever Extruder knife setup that is made up of carbon blades that are held on by a spring-loaded hub,” Felderhoff said.

The knife set up dictates both the length and the shape of the die plate.

“There are two variables to the knife setup that the operator has the ability to control,” he said. “The first being the number of knives that are used. A typical setup is around five to eight knives that touch and cut the kibble. The other variable is the speed at which the knives spin against the die plate. The speed at which the knives turn helps determine the length. The knives, die plate and speed at which they turn are all important in determining the size of kibble.”



The shape and size configurations of a die plate, as well as the speed at which knives rotate around the plate, determine the size and shape of an extruded kibble or treat. Wenger

manager, Corporate Project Services, a division of Wenger Manufacturing, said it's important to know what pet food manufacturers intend to produce (e.g., standard pet food, high-meat pet food, short treats, long treats, etc.) to determine the equipment requirements and layout.

“For example, to be able to produce both pet food and long treats using the same extrusion system, multi-directional die arrangements would be required,” he said. “Long goods would be extruded in the form of ropes straight out onto conveyors. Pet food and short goods would be routed directly into a drying device.”

For products requiring a 50/50 color split, Tramp said there's a unique die that injects color into the extrudate stream to accomplish this.

“More advanced multicolor products may require a second extruder with a specifically designed die that allows both extruders to feed product into the die at the same time,” he added.

Hadrien Delemazure, feed extrusion expert at Firminy, France-based Clextral, said dry kibbles and treats are treated differently at the end of the barrel.

“Dry kibbles are usually cut at the die face,” he said. “These products are slightly expanded and have moisture around 20% to 25% and density around 350-450 grams per liter as they exit the extruder. Die heads are available that can provide up to four shapes simultaneously.

“Pet treats are usually formed by a remote cutter,” Delemazure continued. “Ropes or strings of product exit the extruder and are fed by conveyor to the cutter.”



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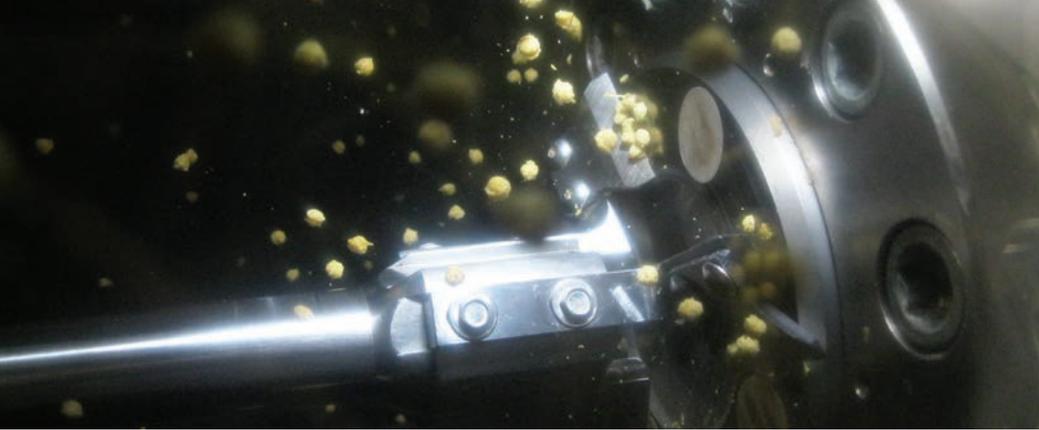
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Kibble is often cut directly at the die plate with a knife setup, while long goods can be conveyed off the plate in long ropes for pre-drying before being cut into their final sizes. Bühler

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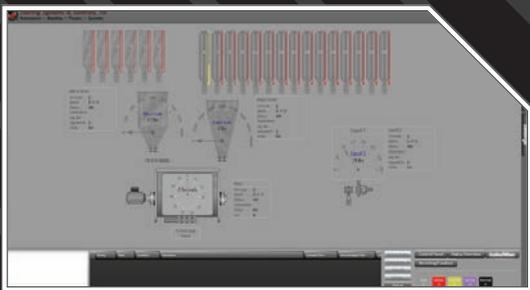
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End-of-extruder components

As for what end-of-extruder options exist for pet food processors, Henry said the company's solution for "premium-type" products would include the energy management valve (EMV), both in regards to providing the necessary production flexibility but also to provide the correct tools to properly manage and execute food safety protocols.

"The EMV gives the operator direct and instantaneous control of the product flow (in terms of energy, expansion, cook and binding) to help compensate for fluctuations including in raw materials, process fluctuations and worn components," he said.

Kirkland said Ever Extruder's available technology includes its Shaft Stabilizer System, Sanitary Start-up Discharge System (SSDS) and Super Cut System, which features a carbide die plate, self-tensioning hub and cutting system.

Nigel Lindley, business development manager for Ever Extruder's Northern Europe and Mediterranean markets, said he feels one of the largest technological breakthroughs in the past 10 years has been utilizing the company's experience with carbide technology that has been taken from the mining and railroad industries through other divisions.

"Due to carbide's resistance to abrasion and wear, extending life of critical parts — for example, extruder-screw lifetime — by more than five times standard competitors' offerings is typical," he said.

Lindley added the company's adjustable Shaft Stabilizer System, placed after the final head of the



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Coextruded products, such as the long goods seen here, require multiple product streams to meet at the end of the barrel and form into one product. Cletral

extruder, is fully accessible, maintaining product flow and optimum centralization of the extruder screws to the barrels and liners, producing a positive pumping action to ensure consistent die pressures and consistency of product shape and expansion.

“...The Ever Extruder shaft stabilizer can be observed and readjusted to maintain optimal centralization,” Lindley explained. “Using carbide technology, the advanced design requires low maintenance and extends screw life on any configuration.”

Lindley added that the company’s SSDS is easily removable, highly adjustable and retrofits most single-screw systems. This solution meets the ever-increasing demands from processors for flexibility, safety, ease of start-up and consistency of product density, as well as, reduced start-up material waste.

Delemazure said Cletral offers bi-coloration kits for the end of the extruder to make two-colored kibble. The product is cut at the die level with a high-capacity cutter.

Additionally, he said dental stick chews are remotely cut with Cletral’s special guillotine-style cutters to provide dental sticks in various shapes and different lengths. These are not expanded products.

Cletral also offers a Quick Change Die (QCD) system that utilizes a hinged die at the end of the extruder that enables a quick change to different products with less downtime or production loss.

Martinez-Kawas said he recommends Wenger’s back pressure valve (BPV) to better control process parameters and extrudate characteristics.

With the many options available for creating the desired final product attributes for extruded pet food and treats, processors have endless possibilities.

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IMPACT

Pet food manufacturers are boosting the economy from farm to bowl.

By Robert Cooper, executive director, IFEEDER | rcooper@afia.org

From traditional kibble to raw food and treats, Americans have many affordable options when it comes to feeding their pets. There's no doubt that people love to spoil their dogs and cats with delicious meals and snacks, yet there has never been a study to examine the immense purchasing power of the pet food industry and how it supports the agricultural economy – until now.

A few years ago, the animal food industry's public charity, the Institute for Feed Education and Research (IFEEDER), conducted a study that looked at what ingredients are used in feed for the country's top nine livestock, poultry and aquaculture species. The comprehensive study was the first time the feed industry had a solid grasp on the sheer amount of farm-grown crops, ingredients and food coproducts that are used to manufacture over 236 million tons of high-quality, nutritious feed for animals annually.

But the study did more than provide quantifiable data for the industry to use in conversations with policymakers and stakeholders. It sparked further questions about how much pets, specifically dogs and cats, consume annually in the United States and what ingredients are

used most frequently in pet food and treats. Given that pet food manufacturers must purchase these ingredients from farmers, ranchers, ingredient manufacturers and other processors, questions also arose on how much the pet food industry is stimulating rural economies.

With these questions in mind, IFEEDER partnered with allied associations the Pet Food Institute (PFI) and the North American Renderers Association (NARA) to develop a study that would examine the economic impact pet food manufacturers have on the United States farm economy and the composition of pet food. It also took into account the ways in which the pet food industry strives to be more sustainable through the use of nutritious byproducts. Together, the associations hired Decision Innovation Solutions (DIS), an economic research and analysis firm out of Iowa, to develop a flexible study that would meet the needs of the three organizations' memberships.

Study methodology

Before launching into this research project, the partner organizations took time to recognize how the pet

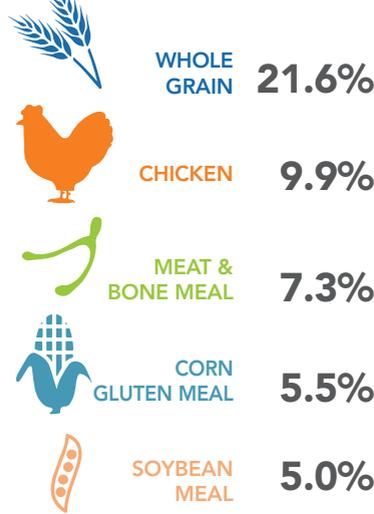
Pet food manufacturers generate economic value throughout the supply chain



TOP 5 most valuable ingredients used in US pet food



TOP 5 ingredients used in US pet food



Pet food processors purchased 8.6 million tons of ingredients valued at \$6.9 billion in 2018.

food marketplace differs from that of the feed industry, which DIS previously studied. For example, pets are often considered “family members,” and thus, pet food is often marketed and produced similarly to human food, with human health trends and fads carrying over into pet food. Pet food can use a variety of protein products as well as fruits and vegetables, providing diverse sourcing points to pet food manufacturers, and it does not need to be produced in close proximity to where it is sold. Also, with many breeds and sizes of dogs and cats and various stages of life, each with their own unique nutritional requirements, DIS recognized it could prove challenging to get a complete picture of the pet food industry.

DIS sought to analyze the total national pet food retail volume and sales; the upstream volume and sales (i.e., benefits to other industries through the purchases of ingredients and supplies); and ingredient composition. It chose to focus primarily on dry food, wet food and treats for both dogs and cats, as well as semi-moist food for dogs, along with a few subcategories under these types.

In order to conduct the study, DIS purchased Nielsen data on dog and cat food sales in the United States from June 1, 2018 through May 30, 2019, capturing SKU/UPC data for six pet food sales channels (Petco, Petsense, Petsmart, PetValue, supermarket and all other channels). However, the data only represented 68.3% of total national pet food sales, so DIS factored up its topline numbers by 1.465 to estimate total sales. Next, DIS collected data on the volume (i.e., package sizes and weight) and dollar value and determined which products, by UPC, represented 95% of dog and cat foods by volume.

Once the firm knew it captured most pet food sales, it could then conduct an analysis of the ingredients used most by order listed on the label and group them into subgroups. Using a methodology called “recipe reverse engineering,” DIS found the corresponding ingredient labels online, which also included the pet foods’ caloric contents and guaranteed analyses, and categorized and prioritized the ingredients into

nutrient groups (e.g., animal protein vs. plant protein). Similar ingredients on the label, such as “carrots” vs. “dehydrated carrots” vs. “dried carrots,” were combined into one category. Then, DIS estimated how much of the ingredients were used in the products based on the nutritional information and price to get the total quantities.

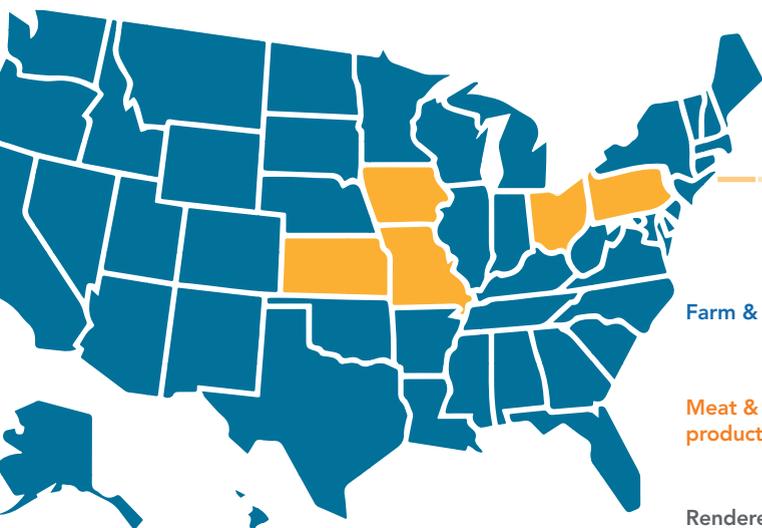
Put simply, the recipe reverse engineering allowed DIS to “pour out” the bag of pet food and put each kibble back into the bag — ingredient-by-ingredient — to achieve the nutritional value listed on the label at the price point given without knowing the exact pet food formulation. From there, DIS could estimate the total amount of that ingredient used and compare it to the national average prices for that ingredient during the time period studied to get the overall economic value of the ingredient.

The analysis included farm- and mill-based ingredients, fresh and frozen meat and poultry products, rendered protein meals, water, fishery products and ingredients, broth from animal and poultry products, and major minerals. Pet food additives, including preservatives, flavors, colors, vitamins and minor minerals and additives, were not measured.

The results

Overall, the research found that US pet food manufacturers are delivering back to the agricultural economy by using 8.65 million tons of animal- and plant-based ingredients for dog and cat food, at a value of \$6.9 billion. Farm and mill-based ingredients topped the list at 4 million tons valued at \$1.4 billion, followed by 1.83 million tons of meat and poultry products (\$3.21 billion), 1.5 million tons of rendered protein meals (\$563 million) and 289 thousand tons of animal and poultry fats (\$153 million).

Of the \$30.3 billion in dog and cat food sales in 2018, an analysis of labels found more than 500 ingredients — from major commodity crops to specialty fruits and vegetables to meat, poultry and seafood to rendered products — to provide complete nutrition for dogs and cats. This demonstrates that the industry is providing diverse options for pet food shoppers at



States reaping the biggest economic benefits

Diverse ingredients are used in US dog and cat food

Farm & mill-based Ingredients (\$1.4B)

4M tons



Meat & poultry products (\$3.21B)

1.8M tons



Rendered protein meals (\$563M)

1.5M tons



Animal & poultry fats (\$153M)

289k tons



Fishery ingredients (\$893M)

199k tons



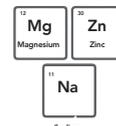
Broth ingredients (\$834M)

167k tons



Minerals & others (\$12.5M)

3,700 tons



Based on a 2020 report that showed 8.65 million tons of food ingredients valued at \$6.9 billion, excluding water.

various price points to fit their budgets and preferences.

These ingredient purchases boost incomes for farmers and farm processors and stimulate additional economic activity through the purchase of farming inputs and supplies via the spending multiplier effect. The research found that the exchange of pet food ingredients leads to the purchase of an additional \$5.3 billion in materials and services for farmers and farm suppliers. This includes inputs such as seed, fertilizer, fuel, machinery and labor. In addition, farm suppliers buy \$4.1 billion in materials and services, such as fuel, fertilizer, equipment and labor, that they in turn sell to suppliers of farmers.

The research also found that sustainable ingredients are cooked directly into pet food. Often using leftover ingredients made from the production of human food, such as bakery or brewery items or parts of the animal that humans do not eat, pet food manufacturers are providing the nutrition pets need and want while supporting the agricultural industry's environmental impact.

Other interesting findings showed that by weight, whole grains and chicken topped the list of ingredients used in pet food, whereas beef and lamb represented the top two most valuable ingredients used.

Of the 9.8 million tons of pet food produced, nearly 774,000 tons were consumed in Texas, followed by nearly 706,000 tons in California and roughly 510,000 tons in Florida, the country's top three states by consumption.

It probably comes as no surprise that the states reaping the biggest economic benefits from the pet food industry are situated primarily in the Midwest, where most crops are grown and most animals are raised. Manufacturers purchased the most products from farmers and farm processors in Missouri, valued at \$999 million, followed by Kansas at \$574 million, Pennsylvania at \$571 million, Iowa at \$422 million and Ohio at \$367 million.

The demand for pet food is strong. The United States pet food industry will continue to thrive as it develops new, innovative solutions to meet the nutritional needs

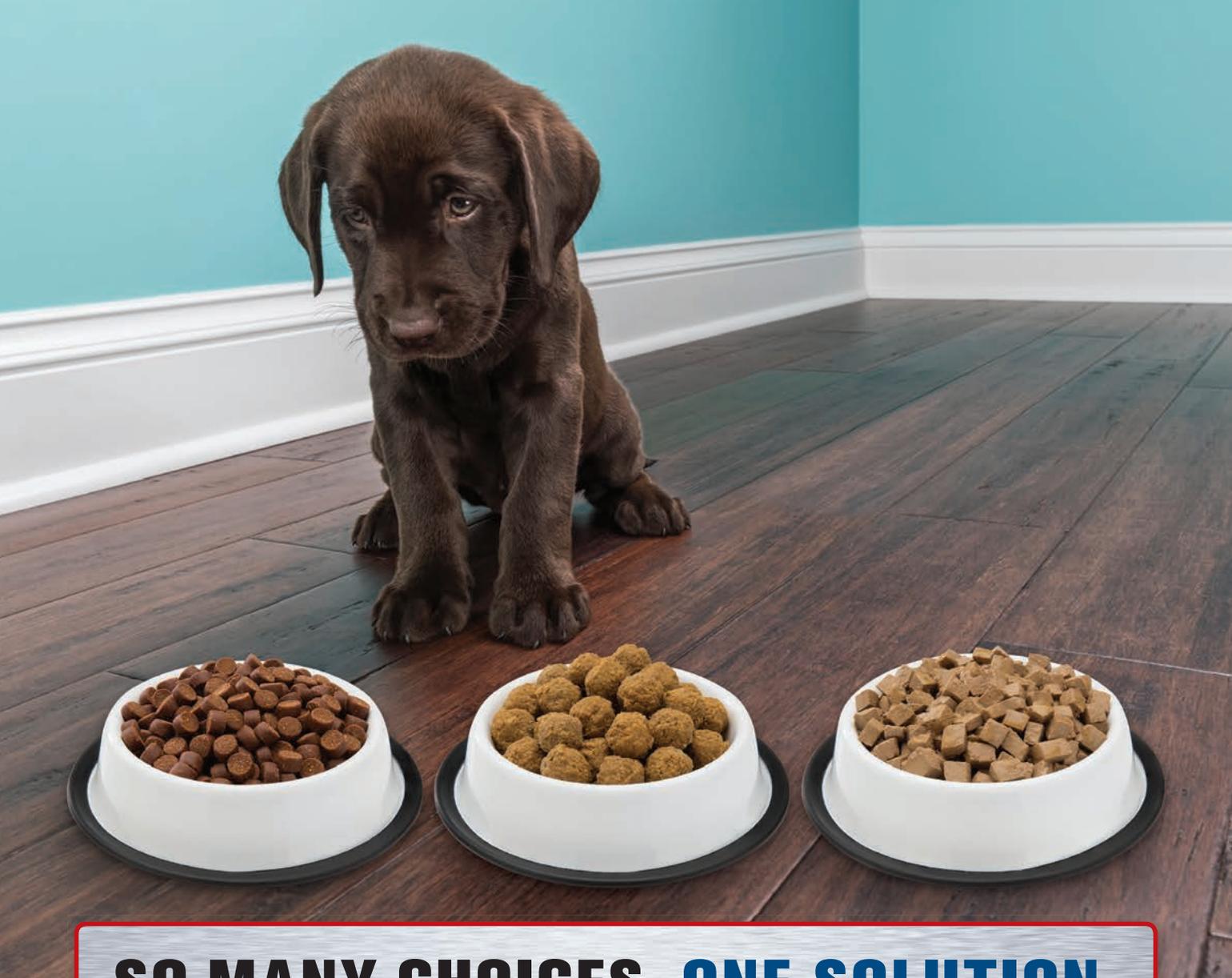
"Pet food manufacturers are providing the nutrition pets need and want while supporting the agricultural industry's environmental impact."

of pets and changing demands of consumers – all while reducing its environmental impact.

What's next?

The partner organizations are conducting briefings with federal regulators and policymakers, commodity groups, state grain and feed associations and others so that they understand the pet food manufacturing industry's economic impact and value in supporting rural agricultural communities. The full report and data, broken down by state and ingredient, can be found online at ifeeder.org. If an organization is interested in learning more, reach out to Robert Cooper at rcooper@afia.org for more information or visit ifeeder.org.

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SEPARATION AND SANITATION

COVID-19 has ushered in a long list of new sanitation protocols that are likely here to stay.

By Jennifer Semple | jsemple@sosland.com

Along with every pet food and treat processor across the country, if not the world, BrightPet Nutrition Group, Lisbon, Ohio, manufacturer of premium pet foods, urgently implemented a long list of new procedures to help protect its employees against the invisible threat of COVID-19 and ensure the company's continued ability to produce food for dogs and cats. Much of the battle within processing plants has become social distancing and fighting fomite spread – virus particles deposited on any inanimate object that can serve as a route of disease transmission.

The social distancing changes made by BrightPet to combat the pandemic include remote working where possible, reorganization of key operational tasks to increase social distancing, new interaction policies with outside parties such as delivery personnel and vendors, staggering start times and breaks to limit the number of employees in one location at a time, installation of plastic screens on the packaging lines to provide a barrier between employees, and splitting a manufacturing line into two shifts.

“Prior to COVID-19, this facility was able to package 24 hours' worth of production on one shift,” said Travis Golladay, general manager, BrightPet. “Since the COVID-19 outbreak, we divided the packaging team and moved to a multiple-shift schedule to maximize social distancing.”

For a company the size of Mars, Incorporated, with 125,000 associates worldwide, implementing changes to prevent human-to-human spread of a virus is no simple task. According to Katie Evans, external affairs manager, Mars Petcare, Franklin, Tenn., the only associates going to Mars locations are those essential to running the factories, veterinary hospitals and a few other critical facilities.

For those associates, Mars has taken additional steps to protect them, including enhanced site cleanings, associate health screenings and procuring of even more health and safety supplies.

“We have introduced ‘social distancing’ in our facilities, which includes staggering shifts and start times and limiting gatherings to only those that are operational critical,” Evans said. “Where legally allowed, we have deployed health screenings and temperature checks for associates coming to work at our factories.”

Touch, clean, repeat

Dominating the list of measures taken to prevent the spread of COVID-19 are expanded sanitation protocols aimed at preventing person-to-person transmission of the virus. In addition to communicating with employees to re-emphasize existing sanitation and illness policies, including frequent and proper handwashing and practices regarding the wearing and changing of gloves

Resources are being diverted due to the increased focus on cleaning and disinfection of frequently touched surfaces in and out of production areas.

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and other sanitary gear, BrightPet has increased sanitation plant-wide. The company has enhanced protocols for cleaning and sanitizing its manufacturing plants and offices, including cleaning more frequently and implementing additional cleanings solutions, additional hand sanitizer stands in all of its manufacturing plants, and increasing the use of its BioMist portable alcohol misting system.

“The BioMist system is something that’s been part of our sanitation program for multiple years,” Golladay said. “It is used during our multiple weekly sanitation events. For the past several weeks we’ve ramped up the frequency of use of that system and have expanded its use into other areas of our facility, including offices and any common areas.”

Production remains steady at BrightPet’s three manufacturing facilities despite all these additional efforts.

“As our organization continues to work with improved procedures in place, we are happy to report that we have not experienced any significant delays in efficiency,” Golladay said.

From an operations standpoint, Plato Pet Treats, Fresno, Calif., has made similar modifications to its sanitation protocols at its treat processing facility in response to COVID-19.

“We have increased the frequency of sanitation of common areas from daily to a minimum of two times per shift,” said Aaron Merrell, president and chief executive officer, Plato Pet Treats. “These areas include locker and break rooms, restrooms and all door handles, as well

as increased the usage and distribution of hand-sanitizing stations at every entrance/exit point, and before and after using the time clock.”

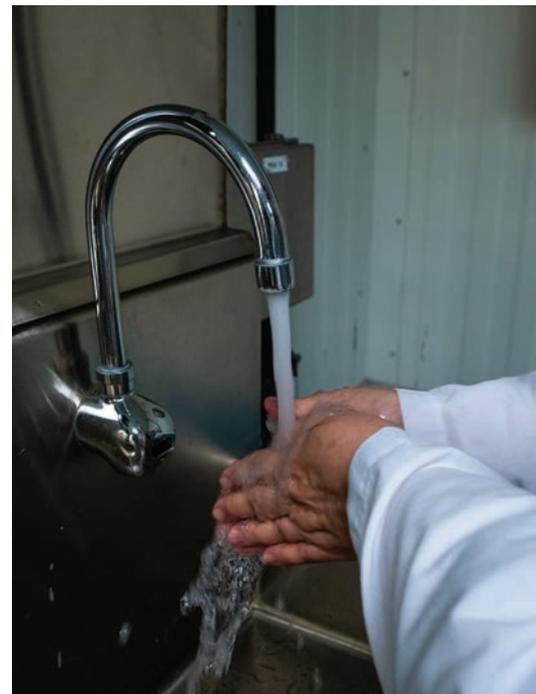
With the exception of additional hours required by the sanitation staff, Merrell reported these changes have had a negligible effect on production and overall plant efficiency and have not impacted the company’s standard food safety procedures.

Protocols to avoid cross-contamination is nothing new in pet food and treat processing plants, but intense focus on combating fomite spread takes plant sanitation to a new level. Doug Marshall, Ph.D., chief scientific officer of microbiology, Eurofins, Des Moines, Iowa, shared a list of the high risk touch points for transmitting microorganisms from person to person that includes door handles, knobs, railings, chairs, tables, copiers, appliances, sinks, toilets, trash bins, soap, sanitizer, towel dispensers, personal protective equipment storage bins, employee lockers, vending machines, control panels, keyboards and log books.

“These transfer points cannot be eliminated so efforts must focus on minimizing their effect,” Marshall said. “Environmental monitoring programs (EMPs) can help processors validate their disinfection programs as effective against SARS-CoV-2 [the virus that causes COVID-19]. If the virus is found on employee touch points, this suggests that there is an unknown asymptomatic spreader or spreaders of the virus in the facility (which means current employee-fit-for-work screening practices aren’t working) and that the disinfection

Hand washing or sanitizing stations at every entrance and exit point and before and after using time clocks has become essential.

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“The heightened safety and sanitation methods allow the company to provide a superior standard for food safety procedures.” Travis Golladay, BrightPet Nutrition Group



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protocol may not be sufficient to eliminate virus from those surfaces.”

Lending a hand

With the sudden adjustments to sanitation standard operating procedures (SSOPs), processors have turned to suppliers for help managing the addition of the many new protocols and the volume of cleaning supplies the new procedures require. Non-production areas have become just as important as production areas, in terms of the need for cleanliness, and are being treated as such.

“It is more important than ever to document the COVID-19 additional sanitation and detection being done in the plant in addition to normal food safety documents,” said Robert Burgh, president, Nexcor Food Safety Technologies, Buford, Ga. “The documentation of the COVID-19 tasks being completed ensures that the appropriate measures are being taken for worker safety in the plant.”

Nexcor has incorporated COVID-19 specific additions to its KLEANZ Food Safety and Sanitation Management system. These include specific COVID-19 reporting capabilities and the ability to quickly prioritize and schedule COVID-19 sanitation tasks on-demand or based on time intervals.

“Companies that survive this outbreak will remember how easily an invisible risk can take its toll on a workforce and will alter protocols accordingly,” Burgh said. “The real opportunity for improvement is within food safety, not just sanitation. Cleaning protocols are important but mitigating overall risks to

food safety company-wide will have a more profound impact in the long term. This includes ensuring that food safety execution is free of gaps and documentation has integrity that can be reviewed for informed, decisive decision making.”

Sourcing the sanitation supplies needed to meet the increased use and guard against any future shortages is also a challenge. Brian Wood, director of HydriPet Ingredient and Sanitation Solutions for Hydrite Chemical Co., Brookfield, Wis., said some processors are increasing the sanitation in common areas that would normally be cleaned once per day, which are now being cleaned three times a day or multiple times per shift. What typically is quarterly fogging with sanitizers has increased as well. Hydrite has been working with its customers to ensure access to anti-microbial products that are EPA-compliant as effective against COVID-19. The company is also providing testing and documentation services to ensure chemistries are compliant and effective.

“With tight supply, we are providing our customers with sanitizers and disinfectants as well as hand care products,” Wood said. “Working with our partners and shifting production, we have been able to supply our customers with minimal disruption.”

Additionally, Hydrite has created a preparedness package to help customers reduce COVID-19 risk and support them should they have a positive case occur in their facility.

Paul Claro, president and chief executive officer, Douglas Machines, Clearwater, Fla., has seen an increased interest in automating washing tasks as the focus has shifted in manufacturing environments to include not only surfaces and items that come in contact with product during processing but also anything

Micro sanitizing systems require no wiping or rinsing.

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in the plant that humans touch or use regularly.

“With sanitation so critical at this time, there is more focus on not just the tubs or trays used for transporting products but now also for the conveyer belts holding those tubs that employees may touch or inadvertently contaminate,” Claro said. “We’ve had more interest in our conveyer belt cleaning systems as well as clean-out-of-place (COP) parts washers, vat/bin washers and barrel, drum and garbage can washers to automate the washing and sanitizing procedures in the plant.”

Technology solutions help processors adhere to new sanitation protocols, document and manage the resources required for the additional efforts.

Nexcor Food Safety Technologies

Sustainable changes

Woods believes some of the food contact and environmental sanitizing options available such as Peroxyacetic Acid (PAA) blends, Chlorine Dioxide and Silver Dihydrogen Citrate (SDC) are becoming of more interest to processors at this particular time, and may become part of a standard microbial control tool going forward.

Merrell sees a potential long-term benefit to the attention on person-to-person transmission of illnesses.

“Our hope and expectation is that hygiene standards will be permanently raised in the minds of our entire team,” Merrell said. “This would be expected to have long-term benefits in preventing future illnesses and lost time/sick days throughout our entire company, and hopefully in society at large.”

Moving forward, BrightPet recognizes that the heightened safety and sanitation methods implemented for COVID-19 allow the company to provide a superior standard for food safety procedures.

“We intend to continue implementing these plant sanitation protocols for the foreseeable future with the understanding some of them may become the new standard,” Golladay said. “We are working tirelessly to do what’s best for everyone who works within our plants and offices, and for all those who serve their pets our super-premium formulas.”

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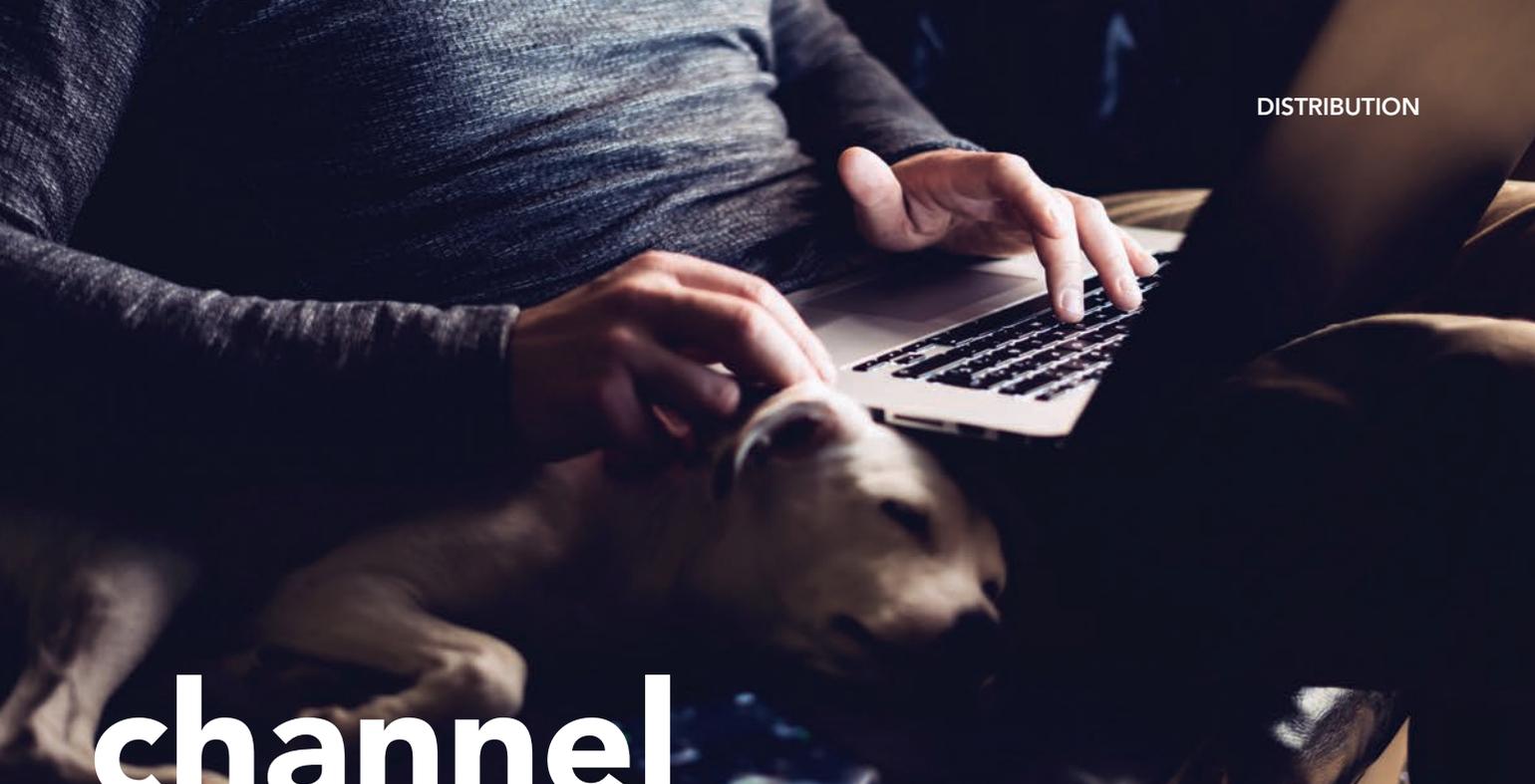
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channel CHALLENGES

Brands today can potentially be everywhere in the market, but an omnichannel approach may not be right for everyone.

By **Jennifer Barnett Fox** | petfoodprocessing@sosland.com

Once upon a time, pet food brands more or less followed a tried-and-true formula of creating product lines for specific distribution channels. As a product increased in popularity, it was often moved or graduated to larger distribution channels. Now, as brands look to buck traditional routes and the associated restraints, manufacturers are seeking new ways to meet and accommodate customers in a variety of distribution channels.

Deciding where to start

Employed to reach customers where they shop, as well as improve and drive better user and customer experiences, an omnichannel distribution strategy allows a company to be in multiple places at once. That could be selling online, in independent brick-and-mortar pet specialty or through big box retailers. While it's increasingly possible to be everywhere at once, it's often beneficial for a brand to first understand what channels are not a good fit, and why. This requires knowing the audience in each channel and its associated wants and needs.

The first step in figuring out better ways to serve audiences in multiple channels necessitates committing to a new level of organizational readiness that includes

extensive customer knowledge, strategy, technology and company-wide communication. Once in place, companies need reliable, easy-to-deploy systems that help with safety, distribution and compliance at a low cost of ownership.

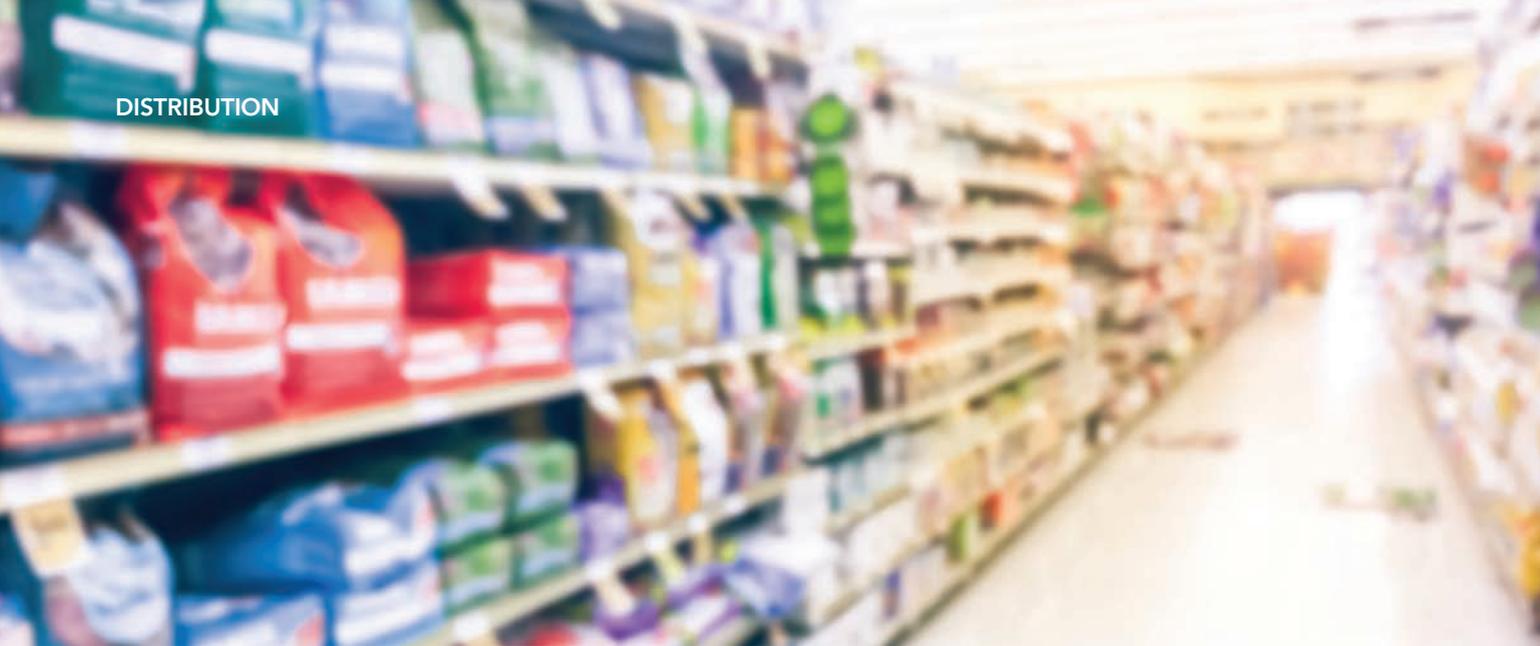
Vormittag Associates, Inc. (VAI), Ronkonkoma, N.Y., offers enterprise management software to assist with the complexity of these varied yet interlinked processes. VAI's cloud solution reduces the complexity of managing all the moving parts of a manufacturing business. Mediated by software and technology, the real-time enterprise resource planning (ERP) solution offers integrated management of a company's main business practices using one database.

"As a manufacturer and distributor, you need a solid ERP system to make sure products are delivered on a timely basis," said Joe Scioscia, vice president of sales at VAI. "This includes the back-office technology to fulfill orders quickly and efficiently along with a good digital marketing strategy that allows you to do email blasts and post on social media, track content consumption and better understand the marketplace and where you can sell."

Working with mid-market-sized companies, VAI is a witness to the growth in private label products coming from small businesses and the explosion of pet food and

Offering e-commerce options for pet food and treats requires a level of organizational readiness to deliver the experience customers expect.

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They may be big, but the grocery, drug, mass and club retail channels can only stock a certain number of products and it can be challenging for a brand to stand out in that environment.

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treat offerings. This includes a growing number of small players catering to the market for health and wellness products using unique flavors and age-specific formulations. As more look to enter the pet food and treat space, they're leveraging technology with online e-commerce as the biggest area of growth.

But just being online is not enough. Scioscia cautioned a high level of organizational readiness is necessary to make e-commerce successful. Despite this, VAI said the supply chain remains underfunded relative to its intricacy. Complexities created within organizations by silos between vital players like sales and marketing leave data and analytics underleveraged to grow sales.

"The technology side of the equation is challenging and not every company knows of the best ways to take advantage of all the different marketplaces to sell to and how to get product out to the channels," Scioscia said.

While the go-to channel options often include big players such as Amazon, Alibaba and Chewy, Scioscia acknowledged it can also be beneficial to have a tool to assist in handling the multiple channels. To be more effective, he recommended exploring a cloud-based inventory management solution such as SellerCloud, an all-in-one e-commerce home.

The virtual middleman for online selling offers an option for companies that struggle with technology to be visible without having to build multiple interfaces. SellerCloud allows a business to post products to more than 40 channel integrations with exposure through one central engine. When an item is sold, SellerCloud allocates it to a sales order and inventory decreases across all channels. This service also includes the ability to integrate with fulfillment by Amazon (FBA) and to sell internationally.

Sustainable, yet effective

Efficient selling is critical, but if the package doesn't arrive in a condition that is safe, reputable and pleasing to the consumer, the sale may not become repeatable. The Packaging Machinery Manufacturers Institute (PMMI),

Reston, Va., represents packaging manufacturers that want to ensure product is delivered safely and shelf life is extended in the right quality and presentation while protecting the format. Until very recently, this included a strong focus on the sustainability and environmental impact of a manufactured product supported by a range of new biomaterial options coming into the market.

Because biomaterial films can't run as quickly, the packaging line must slow down. Slower run times decrease productivity and increase the cost of the product, leaving manufacturers unable to optimize the materials to run at high speeds, according to PMMI. Amid the COVID-19 outbreak, those learnings are on hold as packaging's focus shifts from sustainability and environmental concerns to safe packaging formats that travel well through e-commerce and the extensive handling that's required.

TC Transcontinental Packaging, Montreal, stated the current environment makes plastic packaging more suitable than ever for its ability to increase food security and extend product shelf life at home and in-store.

Jorge Izquierdo, vice president, market development, PMMI, shared that product developed for brick-and-mortar will generally be touched six times. In omnichannel, there can be as many as 15 to 20 touches depending on the channel. Extra touches place additional strain on the durability of the packaging materials.

"When dealing with omnichannel, you typically can't do it on your own, you need trusted partners for distribution and fulfillment, track and trace," Izquierdo said. "It's a key consumer expectation to know where the product is at all times and when it will be delivered. You need to know how to communicate when partners are ready to deliver. If there's a bottleneck, you still need to be able to fulfill the promise to the consumer using communication, synchronization and alignment with partners."

Knowing the partners

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Deciding which product line to sell through which channel requires a processor to have a clear understanding of its customers and the market.

NutriSource

to outsource more work to outside trusted partners who are current on omnichannel efforts. Holly Sher, president of Evanger's Dog & Cat Food Co., Markham, Ill., described the long-term partnerships built between manufacturers and distributors to be similar to a good marriage. For the 85-year-old company, this includes working with a distributor that's not only familiar with the line(s) but the people and ingredients behind the products. Sher points out, however, that as the number of SKUs continue to increase, there will be a limit on the amount of time a distributor has to sell.

"Right now, we're seeing many retailers and distributors increasing orders of canned and dry food," Sher said. "Consumers are stocking up to feed their animals, but we can't say what will happen in a couple of months, especially during these uncertain times."

To optimize its distribution opportunities, Evanger's works with a small distributor and a large distributor in each region. Because some distributors call on similar customers, there can also be an added benefit of competition among distributors. Sher predicted a growing appreciation for products made in the United States, double-digit growth with family-owned distribution centers (big and small), and a to-be-determined element regarding the February merger of Animal Supply Company and Phillips Pet Food & Supplies.

Processor KLN Family Brands, Perham, Minn., chooses to focus on only selling to independent pet retailers. As a family-owned and -run business, the manufacturer of NutriSource branded products looks to support similar businesses. By understanding the needs of its customers, the company finds that most understand and appreciate the company's choice to concentrate its efforts in only one channel. This includes employing a sizable sales force that works daily with its retail and distribution partners to focus on marketing efforts and consumer-based advertising and promotions, according to Darren Fujii, chief growth officer,

national sales manager, KLN Family Brands. By choosing to support the independent retailers, the company is not selling to Amazon and Chewy but instead relying on its partners to provide the e-commerce and delivery options consumers are looking for and supporting its brand in return.

"We have long-built and solid relationships with our distribution partners and are in constant communication with them," Fujii said. "Our model is to partner with one of the national distributors as well as a strong regional distributor in each market. Our partners understand our business model and provide the support we need."

Increasingly, brands are breaking channel lines as changes in pet food and treat sales distribution continue to add pressure on retailers. With more e-commerce players, Fujii said he sees an increase in the competitive landscape but maintains that not all channels can provide the same services or experiences.

Ready or not

Particularly in the current environment, many predict investment in e-commerce will continue to grow substantially. Brands willing to invest in and maintain a well-designed, intuitive, mobile-friendly e-commerce site will allow manufacturers to reap the retail margin while establishing a personal relationship with their end customer, according to Chris Ruben, industry consultant at PetindustryPros.com.

Manufacturers must remain aware of audience needs as they pursue an e-commerce strategy. PMMI recommends manufacturers interested in e-commerce adopt a streamlined approach of developing products that work well throughout the various distribution channels and minimize the number of SKUs to simplify changeovers.

"Unless you have really deep pockets, it's hard to be all things to all pet parents," Ruben concluded. "Research relentlessly, conduct a thorough competitive analysis and test, test, test. Identify your strengths and determine which market(s) best fit your brand and product messaging." **PFP**



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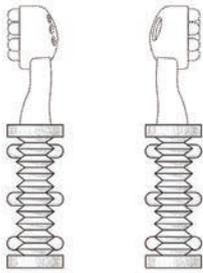
The high velocity SPECTRUM OVEN® is a single pass convection baking platform designed for balanced and consistent baking of pet treats. Control of the exhaust, air temperature and circulation velocity allows the operator to control the product moisture removal rate for maximum quality assurance. A dryer may be combined with the oven zone to create a space-efficient, two-pass, baking chamber.

www.readingbakery.com



PATENTS TO PONDER

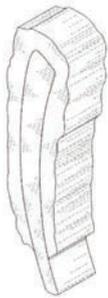
Enjoy this collection of patents granted by the US Patent and Trademark Office to inventors of equipment, ingredients and processes related to the pet food and treat industry.



Toothbrush chew

This pet treat appears to have an edible component at the top, potentially fortified to offer dental health benefits, while the base of the treat could be holding the dental piece intact.

US Patent No. D835,383 (Dec. 11, 2018), Petersen, T., assigned to **Royal Pet Incorporated**, Inver Grove Heights, MN.



Treats of a feather

This simple design resembles a bird's feather, showing an outer layer and an inner layer possibly using more than one flavor or texture to the treat.

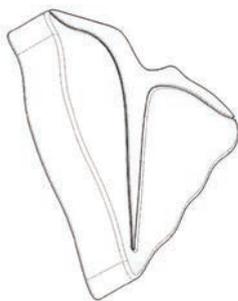
US Patent No. D849,355 (May 28, 2019), Guo, J. et al., assigned to **Big Heart Pet, Inc.**, Orrville, OH.



Rib pet treat

This design appears to give pet owners the option to link multiple treats together, possibly offering longer chew time.

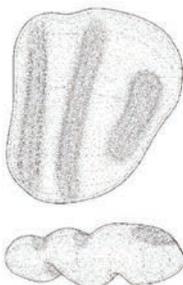
US Patent No. D858,931 (Sept. 10, 2019), van Eyk, G. et al., assigned to **Spectrum Brands, Inc.**, Middleton, WI.



T-bone treat

If it looks like a T-bone, it probably tastes like a T-bone. This pet treat is true to its name.

US Patent No. D858,932 (Sept. 10, 2019), van Eyk, G. et al., assigned to **Spectrum Brands, Inc.**, Middleton, WI.



Irregular kibble shape

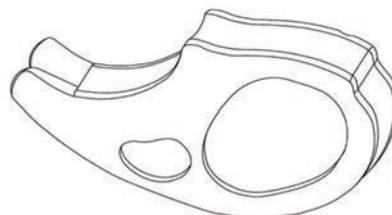
The front and back of this pet food piece are wrinkled to create irregular texture, potentially aiding in palatability or mouthfeel.

US Patent No. D858,936 (Sept. 10, 2019), Bataglia, A. et al., assigned to **Soci t  des Produits Nestl  S.A.**, Vevey, Switzerland.

Pork chop pet treat

This pet treat in the shape of a meaty pork chop appears to be co-extruded or colored to add realistic detail to the pork chop design.

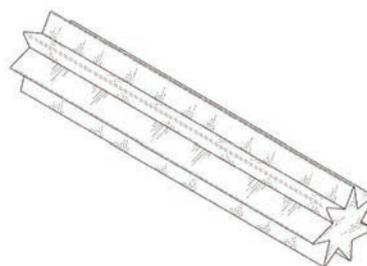
US Patent No. D859,781 (Sept. 17, 2019), van Eyk, G. et al., assigned to **Spectrum Brands, Inc.**, Middleton, WI.



Shooting star-shaped treat

This pet treat is long with two flat sides on each end. The seven-pointed star shape on the ends makes the length of the treat pointy and textured.

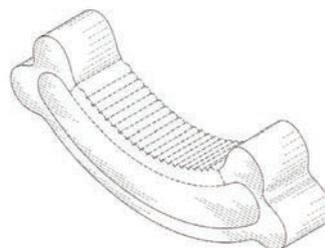
US Patent No. D859,784 (Sept. 17, 2019), Cavalcanti, W. et al., assigned to **Big Heart Pet, Inc.**, Orrville, OH.



Curved bone treat

A bone shape is curved upward, with the top side of the shape showing a rough, textured surface. The rest of the treat is smooth and appears to have an outer and inner layer.

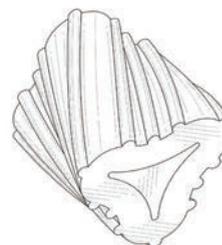
US Patent No. D862,030 (Oct. 8, 2019), Ashby, A. T. et al., assigned to **Big Heart Pet, Inc.**, Orrville, OH.



Thick textured pet treat

This design shows a rigid outer layer and a smoother filling on the inside.

US Patent No. D863,718 (Oct. 22, 2019), Albuja, C. et al., assigned to **Société des Produits Nestlé S.A.**, Vevey, Switzerland.



Log-shaped pet food piece

A long, thin design shows an outer layer that covers the length of the piece and almost completely covers the width, showing a small sliver of the inner layer on one side.

US Patent No. D863,716 (Oct. 22, 2019), Bai, M. et al., assigned to **Shandong Hitrusty Industrial & Trading Co., LTD**, Liaocheng, China.



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<https://perdc.tamu.edu/event/extruded-pet-foods-and-treats-short-course/>

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July 30 – August 1: Des Moines, IA
American Association of Meat Processors
www.aamp.com/event-calendar/convention

AAFCO Annual Meeting

August 6-8: Baltimore, MD
Association of American
Feed Control Officials
www.aafco.org/meetings

Pet Food Alliance Fall Meeting

August 17-18: Kansas City, MO
Pet Food Alliance
<https://fpfalliance.agsci.colostate.edu/>



SuperZoo

September 1-3: Las Vegas, NV
World Pet Association
www.superzoo.org

Food Safety Summit

October 19-22 Rosemont, IL
Food Safety Strategies
www.foodsafetystrategies.com/food-safety-summit

ABA 2020 Technical Conference

October 25-28: Kansas City, MO
American Bakers Association
www.americanbakers.org/2019techconf

AFIA Equipment Manufacturers Conference

November 4-6: New Orleans, LA
American Feed Industry Association (AFIA)
<https://www.afia.org/events/>

Pet Food Workshop

2020 Date TBD: Manhattan, KS
International Grains Program (IGP) Institute,
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www.grains.k-state.edu/igp/on-site-training/feed-manufacturing/pet-food-workshop/

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PET FOOD PROCESSING ISSN 2637-8353 (print), ISSN 2637-840X (online), Volume 3, issue 2 is published quarterly by Sosland Publishing Company, 4801 Main Street, Suite 650, Kansas City, MO 64112. POSTMASTER: Send address changes to Pet Food Processing, PO Box 3001, Northbrook, IL 60065-9743. ©2020 Sosland Publishing Company. All rights reserved. Reproduction of the whole or any part of the contents without written permission is prohibited. Pet Food Processing assumes no responsibility for the validity of claims in items reported. Sosland Publishing Company is a division of Sosland Companies, Inc. Printed in the USA.

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STUDY SUMMARY

In March, three pet food industry leaders — **IFEEDER**, **Pet Food Institute** and the **North American Renderers Association** — compiled a first-of-its kind, comprehensive study of the United States' pet food ingredient and production landscape that quantified several of the positive impacts the pet food and treat industry has on the overall agricultural economy. Learn more about this study from AFIA in this issue on page 51.



TOP 3 ANIMAL-BASED INGREDIENTS BY VALUE



1. Meat and poultry: **\$2.8** BILLION
2. Broth: **\$834.3** MILLION
3. By-product and organ meat: **\$294.7** MILLION



TOP 3 RENDERED INGREDIENTS BY VALUE



1. Meat and bone meal: **\$184.6** MILLION
2. Chicken by-product meal: **\$126.9** MILLION
3. Chicken meal: **\$69.1** MILLION



TOP 3 FARM & MILL INGREDIENTS BY VALUE



1. Mill feed: **\$612.8** MILLION
2. Whole grains: **\$297.4** MILLION
3. Soy product: **\$182** MILLION

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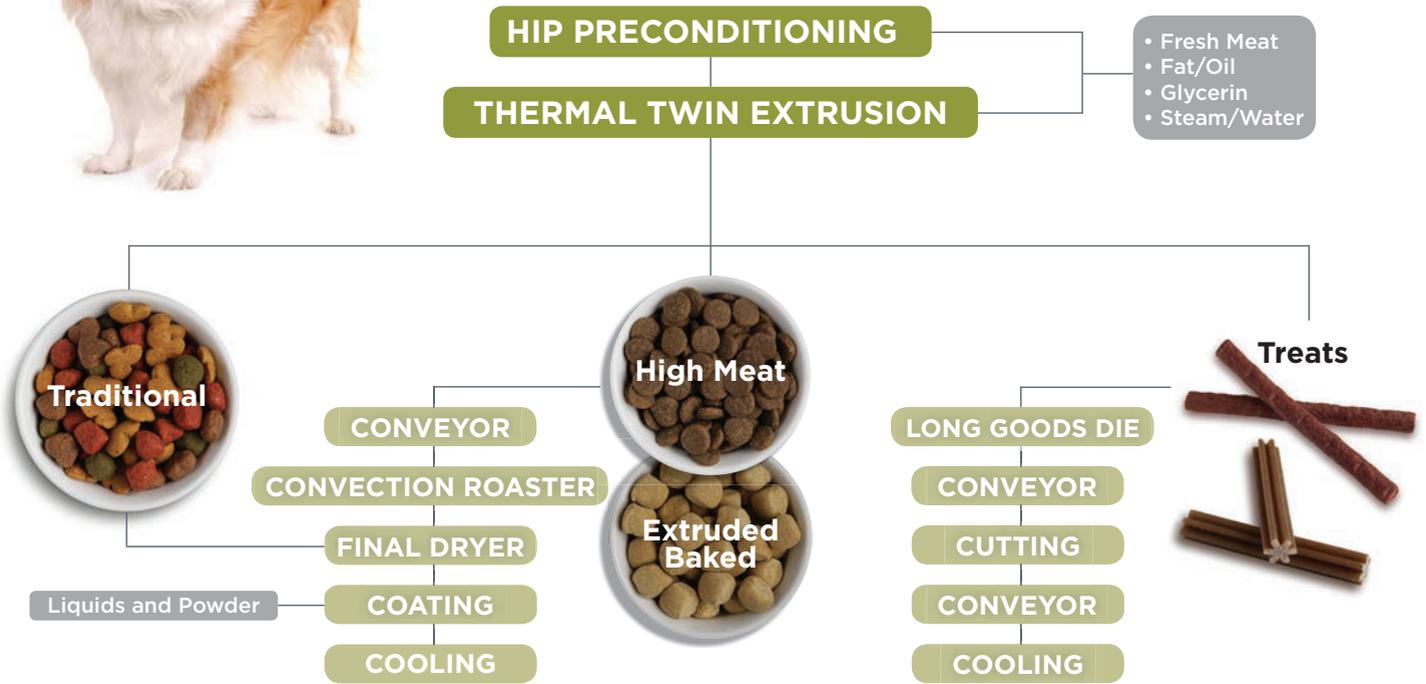


29
facilities

On average in 2018, United States pet food facilities purchased **15,457 tons** of ingredients worth **\$13.3 million**. Those purchases resulted in an average of **\$10.2 million** in farm input purchases and **\$7.9 million** in farm supplier sales of materials and services.



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